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SIXTH EDITION

PSYCHOLOGY



Hockenbury & Hockenbury

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Don H. Hockenbury
Tulsa Community College

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To Marna—with appreciation and gratitude

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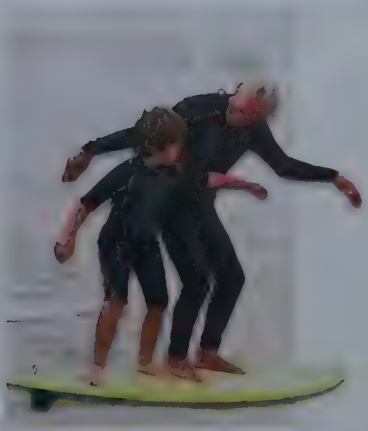
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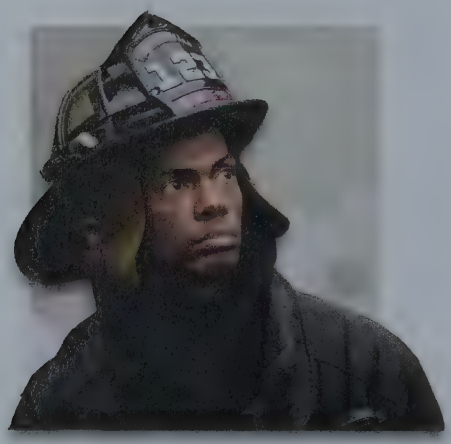
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To the Instructor

Welcome to the sixth edition of *Psychology!* For those of you who are using *Psychology* for the first time, this faculty preface will help orient you to the many features of our text, its supplements, and its media package. If you want to get the most out of our book and teaching package, reading this preface will be well worth your time. To those of you who have used a previous edition of *Psychology,* thank you for helping make our text a success! Rest assured that, once again, we have taken several steps to help make your transition to the new edition as smooth and easy as possible. As we've done previously, we have assembled a complete, detailed, and page-referenced list of changes in the new edition. You can find that list and other helpful materials in the instructor's section of the *Psychology,* Sixth Edition, Web Companion.

We've been gratified by the enthusiastic response to the five previous editions of *Psychology.* We've especially enjoyed the e-mails and letters we've received from students who felt that our book was speaking directly to them. Students and faculty alike told us how much they appreciated *Psychology*'s distinctive voice, its inviting learning environment, the engaging writing style, and the clarity of its explanations—qualities we've maintained in the sixth edition. It's hard to believe, but we've spent the last 20 years of our lives researching and writing six editions of *Psychology* and its smaller sibling, *Discovering Psychology.* Watching the evolution of new research over the past two decades has only further solidified our conviction that psychology is the most exciting of all the sciences.



Neuroscience and Behavior Laughing and talking as you and a friend simultaneously ride your bikes and scan the path for obstacles—even seemingly simple behaviors involve the harmonious integration of multiple internal signals and body processes. What kinds of questions might neuroscientists ask about the common behaviors shown here?

Before we wrote the first word of the first edition, we had a clear vision for this book: combine the scientific authority of psychology with a narrative that engages students and relates to their lives. Drawing from decades (yes, it really has been decades) of teaching experience, we've written a book that weaves cutting-edge psychological science with real-life stories that draw students of all kinds into the narrative.

More so than any other science, psychology speaks to students' lives. It provides a wealth of practical insights about behavior and mental processes. Throughout the text, we strive to communicate the excitement of scientific discovery and the relevance of psychological findings to students. It is a labor of love, not only for the sake of our discipline, but also for those wonderful "aha!" moments when some everyday behavior suddenly makes sense to a student because it's seen in a new light.

This edition of *Psychology* reflects our continued commitment to the goals that have guided us as teachers and authors. Once again, we invite you to explore every page of the new edition of *Psychology,* so you can see firsthand how we:

- Communicate both the scientific rigor and personal relevance of psychology
- Clearly explain psychological concepts and the relationships among them
- Show how classic psychological studies help set the stage for today's research
- Personalize historical figures in psychology with interesting biographical details
- Encourage and model critical and scientific thinking
- Present controversial topics in an impartial and evenhanded fashion
- Expand students' awareness of cultural and gender influences
- Create a student-friendly, personal learning environment
- Actively engage diverse students, including adult learners
- Provide an effective pedagogical system that helps students develop more effective learning strategies

What's New in the Sixth Edition

We began the revision process with the thoughtful recommendations and feedback we received from hundreds of faculty using the text, from reviewers, and from colleagues. We also had face-to-face dialogues with our own students as well as groups of students across the country. After carefully evaluating the feedback from faculty

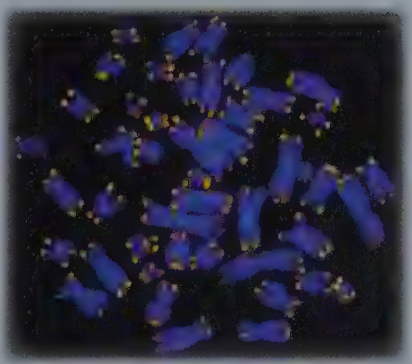
and students, we worked, fueled at times by too many cups of coffee, to create the book you now have in your hands.

This sixth edition reflects an exhaustive updating with new coverage of the latest research, a stunning new design, and some exciting new media options. We have pored over dozens of journals and clicked through thousands of Web sites to learn about the latest in psychological science. As a result, this new edition features hundreds of new references. Just to highlight a few additions, this edition features new or completely revised sections on glial cells (Chapter 2); attention, the functions of consciousness, and meditation (Chapter 4); animal cognition (Chapter 7); epigenetics and moral development (Chapter 9); resilience, social status, and the effects of stress on telomeres (Chapter 13); and mindfulness-based and acceptance psychotherapies (Chapter 15). In addition, we have significantly updated coverage of neuroscience and expanded our coverage of culture and diversity throughout.

The Latest Psychological Science

Faculty members have told us how much they appreciate our efforts to present interesting and current psychology research to students. Keeping up with our incredibly diverse and productive discipline is an ongoing process. Just so you know, we currently subscribe to 12 print and 6 electronic journals, and we regularly monitor multiple psychology, neuroscience, and life science Web sites. And, we both enjoy thumbing through past and current issues of the *New Yorker* in search of just the right cartoon to enliven a new discussion or topic. The stacks of unshelved journals in our respective home offices can sometimes reach truly frightening heights. But scanning journals, newsletters, and science magazines like *New Scientist* and *Discover* often leads us to fascinating new research studies that ultimately find their way into our text. Examples range from the effects of concussions in professional athletes to "hooking up" on campus and evaluating the effectiveness of "baby genius" videos.

As of our last count, there are over 1500 new references in the sixth edition of *Psychology,* more than half of which are from 2009, 2010, or 2011. These new citations reflect the many new and updated topics and discussions in the sixth edition of *Psychology.* From positive psychology to the latest discoveries about stress and telomeres or the effectiveness of meditation in controlling pain and improving attention, our goal is to present students with interesting, clear explanations of psychological science. Later in this preface, you'll find a list of the updates by chapter.



Telomeres *Telomeres* are short, repeated DNA sequences that are found at the very tips of chromosomes (Epel, 2009b). In the photo above, the telomeres are the fluorescent tips on the blue-stained human chromosomes. Like the plastic tips that protect shoelaces from fraying, telomeres protect the genetic data in the chromosomes from being broken or scrambled during cell division. With each cell division, the telomeres get shorter. However, an enzyme called *telomerase* can protect and even lengthen telomeres. Psychologists today are actively studying the environmental factors that affect telomere length, including behavioral interventions that increase telomerase activity (Jacobs & others, 2011).

New Design, New Photos

Created with today's media-savvy students in mind, the clean, modern, new look of *Psychology* showcases the book's cutting-edge content and student-friendly style. Carefully chosen photographs—more than 60 percent of them new—apply psychological concepts and research to real-world situations. Accompanied by information-rich captions that expand upon the text, vivid and diverse photographs help make psychology concepts come alive, demonstrating psychology's relevance to today's students.

New Connections to the American Psychological Association's Principles for Quality Education in Psychology and APA Goals and Outcomes

Many faculty and departments are creating uniform standards for the psychology major and the introductory psychology course. To support faculty's efforts on this front, the sixth edition offers a new appendix on the APA's Principles for Quality Education in Psychology and the APA's goals and outcomes. In addition, the sixth edition test bank ties questions directly to the APA goals.

State-of-the-Art Media Options

There has been a revolution in the educational use of the Web over the past several years. For the sixth edition, our book is accompanied by the latest in educational technology, which combines interactive, visually exciting media with high-quality assessment. This edition is accompanied by *PsychPortal,* an e-book, a video tool kit, and new, interactive presentation slides. For more information about these supplements, please turn to the heading "The Teaching Package: Media Supplements," or you can get more information by going to our companion Web site at www.worthpublishers.com/hockenbury6e.

Three-Dimensional Brain Model

In addition to the cutting-edge coverage of the brain within the book, every new copy of the book can be packaged with a three-dimensional brain created by award-winning designer Bruce Foster and renowned anatomist Todd Buck. Together with the teaching activities available on the instructor Web site, this brain model will help students understand brain anatomy and its relation to human behavior.

Major Chapter Revisions

As you page through our new edition, you will encounter new examples, boxes, photos, and illustrations in every chapter. Below are highlights of some of the most significant changes:

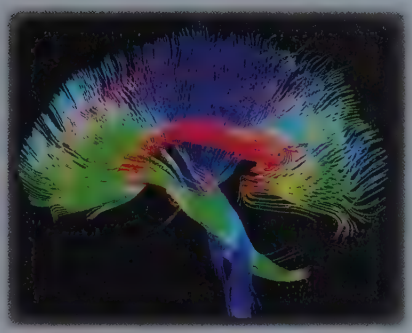
Chapter 1, Introduction and Research Methods

- Updated discussion of the nature–nurture issue
- Revised introduction to the scientific method
- Updated data on specialty areas and employment settings for psychologists
- New research examples and photo illustrations of concepts in research methods, including operational definitions, meta-analysis, and naturalistic observation
- New example illustrates the use of the case study method in research
- New data and table to illustrate survey research, along with a discussion of computer-administered surveys
- Revised discussion of experimental design includes 2011 research on how the environment affects weight gain and the "freshman fifteen"
- Updated and revised "Enhancing Well-Being with Psychology" application on psychology in the media

Chapter 2, Neuroscience and Behavior

- Reorganized discussion of neurons, including a new figure illustrating the different kinds of neurons
- Expanded, updated section describes different glial cell types and is illustrated with stunning new photos and 2011 research
- Revised discussion of drug effects on neurotransmitters introduces new key terms, *agonist* and *antagonist*
- New discussion of traumatic brain injury, concussion, and chronic traumatic encephalopathy, with specific reference to veterans and athletes

- New Focus on Neuroscience, "Mapping the Pathways of the Brain," introduces a new brain-scanning technique, diffusion spectrum imaging, and the Human Connectome Project
- Streamlined Science Versus Pseudoscience box on phrenology
- Expanded and updated box, "Brain Myths," looks at left-brain/right-brain myths, handedness, and the 10 percent myth
- Updated Critical Thinking box, "'His' and 'Her' Brains?"
- New photo of Phineas Gage and streamlined presentation of his case
- Updated research in Enhancing Well-Being with Psychology application, including the effects of exercise on the brain



Mapping the Pathways of the Brain: The Connectome Using a new brainscanning technique called *diffusion spectrum imaging*, neuroscientists produced this three-dimensional image of the neural pathways of the brain. Each fiber in the photo represents hundreds of thousands of individual axons. Blue colors the bundled axons that form up the neural pathway stretching from the top to the bottom of the brain. Green represents pathways from the front (left) to the back (right) of the brain. Red shows the *corpus callosum*, the pathway *between* the right and left brain hemispheres.

Chapter 3, Sensation and Perception

- Updated box on subliminal perception introduces the latest 2011 research
- Updated box on the impact of culture on perception
- Revised Critical Thinking box on ESP presents Daryl Bem's controversial 2011 precognition research
- Revised In Focus box, "Do Pheromones Influence Human Behavior?" includes new material on human chemosignals
- Revised discussion of factors that influence pain "gates" describes recent research on the use of odors to manipulate mood
- New photo examples of Gestalt principles, monocular cues, and depth perception concept review
- Enhancing Well-Being with Psychology application incorporates new research on pain control, including 2011 research on mindfulness meditation and new photo example of acupuncture in the NFL

Chapter 4, Consciousness and Its Variations

- Streamlined, retitled Prologue
- New introductory section on the functions of consciousness
- New section on attention and inattentional blindness, incorporating 2010–2011 studies and a visual demonstration of change blindness
- New discussion of multi-tasking and division of attention
- New 2011 research on brain activation during sleep
- New 2011 research on hypnagogic imagery related to daily experience
- Updated, 2011 research on contagious yawning in chimpanzees as an evolutionary adaptive social cue
- Updated section on the functions of sleep, including new information on sleep and memory, and sleep's effect on the immune and endocrine systems
- New 2011 research on sleep patterns in adolescence
- New Focus on Neuroscience, "The Sleep-Deprived Emotional Brain," features 2011 research on the effects of sleep deprivation on emotional regulation
- Condensed Focus on Neuroscience, "The Dreaming Brain: Turning REM On and Off"
- Revised discussion of the activation-synthesis model of dreaming
- New coverage of the neurocognitive model of dreaming, now a boldfaced key term
- Streamlined coverage of circadian rhythms, sleep and memory formation, sleep disorders, and psychoactive drugs
- Updated research on hypnosis and its applications

- Expanded meditation coverage includes updated terminology and reflects scientific interest in meditation as a way to study how intensive mental training affects brain function and basic psychological processes such as attention, memory, emotion, and pain
- New Focus on Neuroscience "Meditation and the Brain," shows how mental training is associated with structural changes in the brain
- Updated research in the Focus on Neuroscience box, "The Addicted Brain"
- Updated statistics and research on the dangers of prescription painkillers
- New photo and discussion of medical marijuana and its legal status

Chapter 5, Learning

- New examples of stimulus discrimination and generalization in classical conditioning
- New reports on the possible identity of "Little Albert"
- New examples of conditioned reinforcement, schedules of reinforcement, negative reinforcement, and punishment
- Updated research on the use of punishment
- Revised Critical Thinking box, "Is Human Freedom Just an Illusion?" explores the use of virtual gaming systems to promote social good
- Updated research on mirror neurons in humans
- Updated research on observational learning in nonhuman animals
- New information on entertainment education programs in the United States
- Updated research on biological preparedness, evolution, and conditioned fears
- New photo illustrations of classically conditioned emotional reactions, primary and secondary reinforcers, accidental reinforcement, and learned helplessness
- New example of superstitious ritual in professional sports
- Revised and updated Critical Thinking box, "Does Exposure to Media Violence *Cause* Aggressive Behavior?"
- Added photo and biographical information for Martin Seligman, now a boldfaced key person
- Added biographical information on Marian and Keller Breland, with historical photos
- Enhancing Well-Being with Psychology application, "Using Learning Principles to Improve Self-Control," updated with new 2010 research



Superpower Memory in Just Minutes Per Day? Journalist Josh Foer (2011) visited a memory competition expecting to find people with special memory abilities. Instead, he encountered a group of "mental athletes"— people with ordinary minds who had trained their memories to accomplish incredible feats, such as reciting hundreds of random digits or pages of poetry. Told that anyone could develop an expert memory with training, he set out to prove it and devoted months to training his own memory. A year later, he won the USA Memory Championship and even set a new U.S. record by memorizing the position of a deck of cards in one minute, 40 seconds. Josh's secret? Mnemonic techniques, like the *method of loci*—and lots and lots of practice.

Chapter 6, Memory

- Discussion of flashbulb memories updated with new research and examples
- New research on forgetting notes exceptions to the Ebbinghaus forgetting curve
- New 2010 research on how and why testing improves memory
- Expanded discussion of common retrieval glitches
- New photos of Henry Molaison ("H.M.") and biographical discussion of how his life provided numerous scientific insights into memory processes
- Expanded and updated Enhancing Well-Being with Psychology application, "Superpower Memory in Minutes per Day!"

Chapter 7, Thinking, Language, and Intelligence

- Streamlined Prologue
- Expanded discussion of fixation incorporates 2011 research on how expertise can interfere with effective problem-solving
- Revised Critical Thinking box, "The Persistence of Unwarranted Beliefs," includes new material on wishful thinking bias

- Updated and expanded section, "Animal Communication and Cognition," featuring 2011 research on cooperation in elephants and problem-solving in corvids
- New example of the availability heuristic
- New photo and biographical discussion of Robert Sternberg
- New examples to illustrate Howard Gardner's theory of multiple intelligences
- Updated and streamlined discussion of group differences in IQ
- Updated discussion of stereotype threat, including 2010 and 2011 research
- Updated research on creativity in the Enhancing Well-Being with Psychology application
- Many new visual examples of cognitive processes, including decision-making, trial-and-error, creativity, and heuristics

Chapter 8, Motivation and Emotion

- Updated, 2011 information on global and U.S. prevalence of excess weight, obesity, and sedentary lifestyles
- Expanded Focus on Neuroscience, "Dopamine Receptors and Obesity," includes 2010 research on the effects of overeating on the brain's reward system chemistry
- Updated research on gender differences in emotion
- New 2011 cross-cultural research on the universality of emotional expression
- New, ethnically diverse photos of facial expressions of the basic emotions
- Updated 2010 and 2011 research on the effects of Botox on emotional experience as a test of the facial feedback hypothesis
- Thoroughly updated Enhancing Well-Being with Psychology application incorporates new 2010 and 2011 research
- New photo examples of Maslow's hierarchy of motives, cultural influences on eating behavior, achievement motivation, and lie detection

Chapter 9, Lifespan Development

- New Prologue, "Future Plans," explores the effects of culture and history on life stories
- Thoroughly revised genetics discussion features a brand-new section, "The New Science of Epigenetics," which explains how environmental factors trigger gene expression and includes 2010 and 2011 research on the impact of early stress
- Reorganized discussion of prenatal development includes new figure and coverage of prenatal brain development and expanded coverage of teratogens
- Revised and reorganized discussion of physical development in infants now includes cephalocaudal and proximodistal trends
- New Science Versus Pseudoscience box investigates claims that "baby media" can accelerate language and cognitive development
- New material on the timing of puberty
- New material on adolescent social development explores peer influence and romantic and sexual relationships
- New discussion of the development of moral reasoning highlights contemporary responses to Lawrence Kohlberg, now a boldfaced key person
- Expanded discussion of menopause
- Updated statistics on marriage and the family in the United States
- New placement of Critical Thinking box, "The Effects of Child Care on Attachment and Development," emphasizes the importance of this issue to working parents



The Importance of Attachment Secure attachment in infancy forms the basis for emotional bonds in later childhood. At one time, attachment researchers focused only on the relationship between mothers and infants. Today, the importance of the attachment relationship between fathers and children is also recognized (Lucassen & others, in press).

- Updated research on the structure of American families
- New material on cognitive function in late adulthood
- New Focus on Neuroscience, "Boosting the Aging Brain," presents 2011 research showing that even moderate exercise can improve brain functioning
- Revised Enhancing Well-Being with Psychology application notes parenting practices in other cultures

Chapter 10, Gender and Sexuality

- Updated discussions of gender differences and gender-role development
- Revised and updated coverage of sexual attitudes
- Expanded discussion of sexual orientation, with the latest prevalence estimates
- Section on sexual behavior updated with results from the National Survey of Sexual Health and Behavior, the National Survey of Family Growth, and the National Social Life, Health, and Aging Project
- Revised section on sexual disorders and problems
- Streamlined In Focus box, "Everything You Wanted to Know About Sexual Fantasies"
- Updated and expanded Critical Thinking box on mate preferences and evolutionary psychology
- New In Focus box, "Hooking Up on Campus," explores a cultural shift in sexual behavior

Chapter 11, Personality

- New artwork depicting Freud's classic iceberg analogy of personality
- New Focus on Neuroscience on the neuroscience of the "big five" personality traits
- New section on the Myers-Briggs Type Indicator test, its uses and limitations
- Updated research on personality assessment techniques
- Many new photo examples, including super-ego, sublimation, and self-efficacy



Deindividuation: Anonymity and Reduced Self-Awareness Hats and masks heightened the sense of anonymity felt by rioters in London during the summer of 2011. So did the general chaos on the streets, where throngs of people set fire to cars and looted local shops. Such factors add to the likelihood that people will commit antisocial acts that they would not commit if their identities were known (Morrell & others, 2011).

Chapter 12, Social Psychology

- New coverage of evolutionary approach to social psychology, and the importance of the *sense of self*, now a boldfaced key term
- Streamlined and updated discussion of person perception
- Fully revised section on social categorization now includes implicit and explicit cognition as boldfaced key terms
- Expanded and updated discussion of physical attractiveness
- Updated and expanded Focus on Neuroscience, "Brain Reward When Making Eye Contact with Attractive People"
- Revised discussion of attribution adds hindsight bias as new boldfaced key term
- New In Focus box, "Interpersonal Attraction and Liking"
- New section on implicit attitudes and the Implicit Association Test, with 2011 research
- Discussion of contemporary replication of Milgram's obedience study
- Updated and revised sections on bystander intervention and group processes, with new research and contemporary examples
- New photos and captions provide contemporary examples of the role of implicit personality theory in deceiving others, the persistence of the "what is beautiful is good" myth, blaming the victim bias, and bystander intervention

Chapter 13, Stress, Health, and Coping

- New prologue, "Fire and Ash," describes how two people respond to the stress of a major disaster and its aftermath
- New introduction to stress and health psychology uses the example of a gratitude list to explain how thoughts and moods can affect physical processes
- New figure depicting the role of appraisal in stress and coping
- New section on traumatic events distinguishes between normal coping and post-traumatic stress disorder
- New section on developing resilience incorporates 2010 research
- Revised discussion of daily hassles, including updated research on gender differences
- New photo example illustrates how major life events can create daily hassles
- New table listing examples of daily hassles, including specific examples of hassles faced by college students and by children dealing with the stress of adapting to a new culture
- Expanded section on social and cultural sources of stress, with new research on racism as a particularly potent stressor and the importance of perceived social status
- New section on work stress and burnout
- Reorganized section on the physical effects of stress, including distinction between acute and chronic stress
- All new section, "Stress, Chromosomes, and Aging: The Telomere Story," includes three new figures
- Updated research on personality, emotions, stress, and health
- New examples of research evidence for the importance of close relationships in our ability to deal with stressors
- Revised discussion of gender in the effects of social support
- Revised coverage of coping strategies includes new cross-cultural research
- New research on the health benefits of diversity in social support networks
- New photo examples of coping with stress, including new illustrations of finding meaning in tragedy and the effects of culture on coping
- Enhancing Well-Being with Psychology application, "Minimizing the Effects of Stress," includes a new section on mindfulness meditation and instructions for practicing a simple mindfulness of breathing meditation

Chapter 14, Psychological Disorders

- Revised Prologue, "Behind the Steel Door"
- New figure and data on the prevalence and incidence of psychological disorders in the United States
- Expanded coverage of the DSM-IV-TR presents a history of the manual, including critiques and a discussion of DSM-5
- Expanded attention to comorbidity, including updated results from the replication of the National Comorbidity Survey (NCS-R)
- Critical Thinking box updated with new research on violence and mental illness
- Updated research on eating disorders and new photo examples
- Current research on incidence of post-traumatic stress disorder in U.S. military personnel who have served in Iraq and Afghanistan, and on the long-term effects of exposure to terrorist attacks
- Updated information on the personality disorders
- Expanded discussion of borderline personality disorder, with updated statistics and new coverage of Marsha Linehan's biosocial developmental theory



Jeff Tweedy and Panic Disorder
Founder of the alternative rock band Wilco, Jeff Tweedy has suffered from severe panic attacks for years. Tweedy (2008) explains the vicious cycle that underlies panic disorder: "You'll have an actual panic attack and for weeks or months after that you'll have a fear of a panic attack that can heighten your anxiety and heighten your stress levels to the point where you end up having another panic attack." After psychological treatment, Tweedy is now better able to manage his symptoms of panic disorder.

- Expanded and updated research on genetic factors in schizophrenia and bipolar disorder includes 2011 findings
- New photo illustrations put a human face on psychological disorders, spotlighting people who have been diagnosed with panic disorder (Jeff Tweedy of Wilco), post-traumatic stress disorder, obsessive-compulsive disorder (Howard Hughes), major depression (Kurt Cobain, Sheryl Crow), bipolar disorder (Carrie Fisher), anorexia, schizophrenia, dissociative fugue, and multiple personality disorder

Chapter 15, Therapies

- Counseling Psychologist added to list of mental health professionals
- Updated information on the status of prescription privileges for psychologists
- Updated research on psychoanalysis, interpersonal therapy, humanistic therapy, and motivational interviewing
- New section on mindfulness and acceptance-based therapies
- New, extended example of desensitization combined with observational learning to treat flying phobia; updated research on aversive conditioning
- Updated research on rational emotive therapy and cognitive behavior therapy
- Revised and updated discussion of token economy and contingency management therapy
- New discussion of integrative psychotherapy
- Updated research on the effectiveness of atypical antipsychotic medications
- New data on the use of antidepressants in the United States and research that questions claims of their effectiveness
- Updated coverage of electroconvulsive therapy, plus new coverage of transcranial magnetic stimulation, vagus nerve stimulation, and deep brain stimulation

Appendix B, Industrial/Organizational Psychology

- Updated mechanical ability test sample
- New photo examples of ergonomically designed work environment, teleworking, and work-family balance

Appendix C, APA Principles for Quality Education in Psychology and APA Goals and Outcomes

- New section on the APA Principles for Quality Education in Psychology demonstrates how this text supports introductory psychology students and instructors in achieving these goals.

Features of *Psychology*

For all that is new in the sixth edition, we were careful to maintain the unique elements that have been so well received in the previous editions. Every feature and element in our text was carefully developed and serves a specific purpose. From comprehensive surveys, reviewers, and our many discussions with faculty and students, we learned what elements people wanted in a text and why they thought those features were important tools that enhanced the learning process. We also surveyed the research literature on text comprehension, student learning, and memory. In the process, we acquired many valuable insights from the work of cognitive and educational psychologists. Described below are the main features of *Psychology* and a discussion of how these features enhance the learning process.

The Narrative Approach

> Associate the new with the old in some natural and telling way, so that the interest, being shed along from point to point, fully suffuses the entire system of objects. . . . Anecdotes and reminiscences [should] abound in [your] talk; and the shuttle of interest will shoot backward and forward, weaving the new and the old together in a lively and entertaining way.
>
> —*William James*, Talks to Teachers (1899)

As you'll quickly discover, our book has a very distinctive voice. From the very first page of this text, the reader comes to know us as people and teachers through carefully selected stories and anecdotes. Some of our friends and relatives have also graciously allowed us to share stories about their lives. The stories are quite varied—some are funny, others are dramatic, and some are deeply personal. All of them are true.

The stories we tell reflect one of the most effective teaching methods: the *narrative approach.* In addition to engaging the reader, each story serves as a pedagogical springboard to illustrating important concepts and ideas. Every story is used to connect new ideas, terms, and ways of looking at behavior to information with which the student is already familiar.

Prologues

As part of the narrative approach, every chapter begins with a **Prologue,** a true story about ordinary people with whom most students can readily identify. The Prologue stories range from the experiences of a teenager with Asperger's Syndrome, to people struggling with the after-effects of a devastating wildfire, to the story of a man who regained his sight after decades of blindness. Each Prologue effectively introduces the chapter's themes and lays the groundwork for explaining why the topics treated by the chapter are important. The Prologue establishes a link between familiar experiences and new information—a key ingredient in facilitating learning. Later in the chapter, we return to the people and stories introduced in the Prologue, further reinforcing the link between familiar experiences and new ways of conceptualizing them.

Logical Organization, Continuity, and Clarity

As you read the chapters in *Psychology,* you'll see that each one tells the story of a major topic in a logical way that flows continuously from beginning to end. Themes are clearly established in the first pages of the chapter. Throughout the chapter, we come back to those themes as we present subtopics and specific research studies. Chapters are thoughtfully organized so that students can easily see how ideas are connected. The writing is carefully paced to maximize student interest and comprehension. Rather than simply mentioning terms and findings, we explain concepts clearly. And we use concrete analogies and everyday examples, rather than vague or flowery metaphors, to help students grasp abstract concepts and ideas.

Paradoxically, one of the ways that we maintain narrative continuity throughout each chapter is through the use of in-text boxes. The boxes provide an opportunity to explore a particular topic in depth without losing the narrative thread of the chapter. The **In Focus** boxes do just that—they focus on interesting topics in more depth than the chapter's organization would allow. These boxes highlight interesting research, answer questions that students commonly ask, or they show students how psychological research can be applied in their own lives. The sixth edition of *Psychology* includes the following In Focus boxes:

- Questions About the Use of Animals in Psychological Research, p. 37
- Do Pheromones Influence Human Behavior?, p. 106
- What You Really Want to Know About Sleep, p. 141
- What You Really Want to Know About Dreams, p. 152
- Watson, Classical Conditioning, and Advertising, p. 193
- Evolution, Biological Preparedness, and Conditioned Fears: What Gives You the Creeps?, p. 198

- Changing the Behavior of Others: Alternatives to Punishment, p. 206
- Déjà Vu Experiences: An Illusion of Memory?, p. 250
- H.M. and Famous People, p. 267
- Does a High IQ Score Predict Success in Life?, p. 296
- Neurodiversity: Beyond IQ, p. 302
- Detecting Lies, p. 341
- Beyond Male and Female: Variations in Gender Identity, p. 417
- Everything You Wanted to Know About Sexual Fantasies, p. 428
- Hooking Up on Campus, p. 429
- Explaining Those Amazing Identical-Twin Similarities, p. 472
- Interpersonal Attraction and Liking, p. 495
- Providing Effective Social Support, p. 549
- Gender Differences in Responding to Stress: "Tend-and-Befriend" or "Fight-or-Flight?", p. 551
- Using Virtual Reality to Conquer Phobias, p. 618
- Self-Help Groups: Helping Yourself by Helping Others, p. 627
- Servant Leadership: When It's Not All About You, p. B-10
- Name, Title, Generation, p. B-11

Scientific Emphasis

Many first-time psychology students walk into the classroom operating on the assumption that psychology is nothing more than common sense or a collection of personal opinions. Clearly, students need to walk away from an introductory psychology course with a solid understanding of the scientific nature of the discipline. To help you achieve that goal, in every chapter we show students how the scientific method has been applied to help answer different kinds of questions about behavior and mental processes.

Because we carefully guide students through the details of specific experiments and studies, they develop a solid understanding of how scientific evidence is gathered and the interplay between theory and research. And because we rely on original rather than secondary sources, students get an accurate presentation of both classic and contemporary psychological studies.

One unique way that we highlight the scientific method in *Psychology* is with our trademark **Science Versus Pseudoscience** boxes. In these boxes, students see the importance of subjecting various claims to the standards of scientific evidence. These boxes promote and encourage scientific thinking by focusing on topics that students frequently ask about in class. The sixth edition of *Psychology* includes the following Science Versus Pseudoscience boxes:

- What Is a Pseudoscience?, p. 22
- Phrenology: The Bumpy Road to Scientific Progress, p. 64
- Brain Myths, p. 79
- Subliminal Perception, p. 91
- Can a DVD Program Your Baby to Be a Genius?, p. 374
- Graphology: The "Write" Way to Assess Personality?, p. 475
- EMDR: Can You Wave Your Fears Away?, p. 632



Ruby Washington/The New York Times

Encouraging Language Development
Research shows that one of the most effective ways to enhance a child's cognitive development is to read to her—even in infancy (Robb & others, 2009). Rather than spending money on expensive videos, buy books or check them out from your local library.

Critical Thinking Emphasis

Another important goal of *Psychology* is to encourage the development of critical thinking skills. To that end, we do not present psychology as a series of terms, definitions, and facts to be skimmed and memorized. Rather, we try to give students an understanding of how particular topics evolve. In doing so, we also demonstrate the process of challenging preconceptions, evaluating evidence, and revising theories based on new evidence. In short, every chapter shows the process of psychological research—and the important role played by critical thinking in that enterprise.

Because we do not shrink from discussing the implications of psychological findings, students come to understand that many important issues in contemporary psychology are far from being settled. Even when research results are consistent, how to interpret those results can sometimes be the subject of considerable debate. As the authors of the text, we very deliberately try to be evenhanded and fair in presenting both sides of controversial issues. In encouraging students to join these debates, we often challenge them to be aware of how their own preconceptions and opinions can shape their evaluation of the evidence.

Beyond discussions in the text proper, every chapter includes one or more **Critical Thinking** boxes. These boxes are carefully designed to encourage students to think about the broader implications of psychological research—to strengthen and refine their critical thinking skills by developing their own positions on questions and issues that don't always have simple answers. Each Critical Thinking box ends with two or three questions that you can use as a written assignment or for classroom discussion. The sixth edition of *Psychology* includes the following Critical Thinking boxes:

- What Is Critical Thinking?, p. 18
- "His" and "Her" Brains?, p. 74
- ESP: Can Perception Occur Without Sensation?, p. 114
- Is Hypnosis a Special State of Consciousness?, p. 162
- Is Human Freedom Just an Illusion?, p. 208
- Does Exposure to Media Violence *Cause* Aggressive Behavior?, p. 223
- The Memory Wars: Recovered or False Memories?, p. 259
- The Persistence of Unwarranted Beliefs, p. 288
- Has Evolution Programmed Us to Overeat?, p. 329
- Emotion in Nonhuman Animals: Laughing Rats, Silly Elephants, and Smiling Dolphins?, p. 346
- The Effects of Child Care on Attachment and Development, p. 396
- Are Women *Really* More Emotional Than Men?, p. 413
- Freud Versus Rogers on Human Nature, p. 461
- Freud Versus Bandura on Human Aggression, p. 465
- Abuse at Abu Ghraib: Why Do Ordinary People Commit Evil Acts?, p. 512
- Do Personality Factors Cause Disease?, p. 546
- Are People with a Mental Illness as Violent as the Media Portray Them?, p. 562
- Does Smoking Cause Depression and Other Psychological Disorders?, p. 580

Cultural Coverage

As you can see in Table 1, we weave cultural coverage throughout many discussions in the text. But because students are usually unfamiliar with cross-cultural psychology, we also highlight specific topics in **Culture and Human Behavior** boxes. These boxes increase student awareness of the importance of culture in many areas of human experience. They are unique in that they go beyond simply describing

TABLE 1

Integrated Cultural Coverage

In addition to the topics covered in the Culture and Human Behavior boxes, cultural influences are addressed in the following discussions.

Page(s)	Topic
12	Cross-cultural perspective in contemporary psychology
12	Culture, social loafing, and social striving
53	Effect of traditional Chinese acupuncture on endorphins
91	Israeli study on the effects of subliminal stimuli on political attitudes
128	Use of acupuncture in traditional Chinese medicine for pain relief
163–164	Meditation in different cultures
164	Research collaboration between Tibetan Buddhist monks and Western neuroscientists
167	Racial and ethnic differences in drug metabolism rate
167	Cultural norms and patterns of drug use
167	Differences in alcohol use by U.S. ethnic groups
172	Tobacco and caffeine use in different cultures
175	Peyote use in religious ceremonies in other cultures
175	Medicinal use of marijuana in ancient China, Egypt, India, and Greece
176	Rave culture and drug use in Great Britain and Europe
208	Clash of B. F. Skinner's philosophy with American cultural ideals and individualistic orientation
222–224	Cross-cultural application of observational learning principles in entertainment-education programming in Mexico, Latin America, Asia, and Africa
243–244	Cross-cultural research on the tip-of-the-tongue phenomenon
290	Spontaneous development of sign languages in Nicaragua and Bedouin village as cross-cultural evidence of innate human predisposition to develop language
295	Historical misuse of IQ tests to evaluate immigrants
296	Wechsler's recognition of the importance of culture and ethnicity in developing the WAIS intelligence test
299–300	Role of culture in Gardner's definition and theory of intelligence
301	Role of culture in Sternberg's definition and theory of intelligence
305	IQ and cross-cultural comparison of educational differences
306–307	Effect of culture on IQ score comparisons
307	Potential effect of culture on intelligence test performance
308–309	Rapid gains in IQ scores in different nations
309–310	Cross-cultural studies of group discrimination and IQ
311	Role of culture in tests and test-taking behavior
322	Culture's effect on food preference and eating behavior
331	Obesity rates in cultures with different levels of economic development
336–337	Culture and achievement motivation
339	Culturally universal emotions
340	Culture and emotional experience
340	Cross-cultural research on gender and emotional expressiveness
342	Cross-cultural studies of psychological arousal associated with emotions
345–348	Universal facial expressions
347–348	Culture, cultural display rules, and emotional expression
371	Cultural influences on temperament
371	Cross-cultural studies of attachment
372	Native language and infant language development
372–373	Cross-cultural research on infant-directed speech
372–373	Culture and patterns of language development
377	Influence of culture on cognitive development
387	Cultural influences on timing of adolescent romantic relationships
391–392	Culture and moral reasoning
402	Cultural differences in the effectiveness of different parenting styles
409–410	Culture's influence on gender and gender roles
410	Gender stereotypes in different cultures
435–437	Prevalence rates of AIDS among different ethnic and racial groups in the United States and in different societies worldwide
445–446	Freud's impact on Western culture
446–447	Cultural influences on Freud's psychoanalytic theory
455–456	Cultural influences on Jung's personality theory
456	Jung on archetypal images, including mandalas, in different cultures
456–457	Cultural influences on the development of Horney's personality theory
461	Rogers on cultural factors in the development of antisocial behavior
469	Cross-cultural research on the universality of the five-factor model of personality
488–489	Cultural conditioning and the "what is beautiful is good" myth
492	Attributional biases in individualistic versus collectivistic cultures
495	Cultural differences in interpersonal attraction
498–499	Stereotypes, prejudice, and group identity
499	Ethnocentrism
512–513	Influence of cultural norms on conformity
510	Cross-cultural comparisons of destructive social influence
512–513	Role of cultural differences in abuse at Abu Ghraib prison in Iraq
530	Cross-cultural research on life events and stress
532–333	Cultural differences as source of stress
542	Cross-cultural research on the benefits of perceived control
553–554	Effect of culture on coping strategies
561	Role of culture in distinguishing between normal and abnormal behavior
563	Use of DSM categories to compile cross-cultural data on prevalence of psychological disorders
570	Cultural variants of panic disorder and panic attacks
570	*Taijin kyofusho*, a culture-specific disorder related to social phobia
572	PTSD in child soldiers in Uganda and Congo
574	Cultural influences in obsessions and compulsions
583–584	Western cultural ideals of beauty and prevalence rates of eating disorders
589	Role of culture in dissociative experiences
594	Prevalence of schizophrenia in different cultures
600	Findings from the Finnish Adoptive Family Study of Schizophrenia
612	Use of interpersonal therapy to treat depression in Uganda
611–612	Impact of cultural differences on effectiveness of psychotherapy
636	Efficacy of traditional herbal treatment for psychotic symptoms in India

cultural differences in behavior. They show students how cultural influences shape behavior and attitudes, including the student's own behavior and attitudes. The sixth edition of *Psychology* includes the following Culture and Human Behavior boxes:

- What Is Cross-Cultural Psychology?, p. 13
- Ways of Seeing: Culture and Top-Down Processes, p. 113
- Culture and the Müller-Lyer Illusion: The Carpentered-World Hypothesis, p. 126
- Culture's Effects on Early Memories, p. 241
- The Effect of Language on Perception, p. 290
- Performing with a Threat in the Air: How Stereotypes Undermine Performance, p. 308
- Where Does the Baby Sleep?, p. 370
- Evolution and Mate Preferences, p. 422
- Explaining Failure and Murder: Culture and Attributional Biases, p. 492
- The Stress of Adapting to a New Culture, p. 534
- Travel Advisory: The Jerusalem Syndrome, p. 594
- Cultural Values and Psychotherapy, p. 634



Separate Worlds? In childhood, girls tend to establish close relationships with one or two other girls and to cement their friendships by sharing thoughts and feelings. In contrast, boys tend to play in groups and favor competitive games and team sports. How might such gender differences affect intimate relationships in adolescence and adulthood?

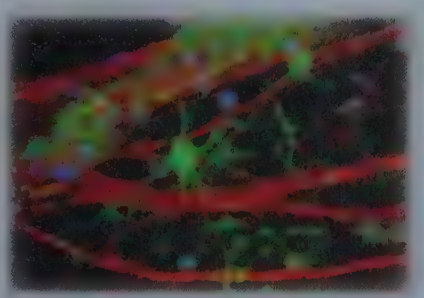
Gender Coverage

Gender influences and gender differences are described in many chapters. Table 2 shows the integrated coverage of gender-related issues and topics in *Psychology*. To help identify the contributions made by female researchers, the full names of researchers are provided in the References section at the end of the text. When researchers are identified using initials instead of first names (as APA style recommends), many students automatically assume that the researchers are male.

Neuroscience Coverage

Psychology and neuroscience have become intricately intertwined. Especially in the last decade, the scientific understanding of the brain and its relation to human behavior has grown dramatically. The imaging techniques of brain science—PET scans, MRIs, and functional MRIs—have become familiar terminology to many students, even if they don't completely understand the differences between them. To reflect that growing trend, we have increased our neuroscience coverage to show students how understanding the brain can help explain the complete range of human behavior, from the ordinary to the severely disturbed. Each chapter contains one or more **Focus on Neuroscience** discussions that are designed to complement the broader chapter discussion. Here is a complete list of the Focus on Neuroscience features in the sixth edition:

- Psychological Research Using Brain Imaging, p. 34
- Is "Runner's High" an Endorphin Rush?, p. 54
- Mapping the Pathways of the Brain, p. 65
- Juggling and Brain Plasticity, p. 66
- Vision, Experience, and the Brain, p. 97
- The Sleep-Deprived Emotional Brain, p. 147
- The Dreaming Brain: Turning REM On and Off, p. 149
- Meditation and the Brain, p. 165
- The Addicted Brain: Diminishing Rewards, p. 168
- How Methamphetamines Erode the Brain, p. 174



Glial Cells: More Than Just the Brain's Packing Material This colored micrograph shows the first stages of myelin formation by an *oligodendrocyte*, colored green. Like a spider spinning a web, the oligodendrocyte sends tendrils out to neighboring axons (red) and wraps layers of myelin around them in a spiral-shaped pattern (Fields, 2001a; Nave, 2010).

TABLE 2

Integrated Gender Coverage

Page(s)	Topic
4	Titchener's inclusion of female graduate students in his psychology program in the late 1800s
6-7	Contributions of Mary Whiton Calkins to psychology
6-7	Contributions of Margaret Floy Washburn to psychology
60-61	Endocrine system and effects of sex hormones
74	Sex differences and the brain
99	Gender differences in incidence of color blindness
106	Gender differences in responses to human chemosignals (pheromones)
110	Gender differences in the perception of pain
150	Gender differences in dream content
151	Gender and nightmare frequency
154	Gender differences in driving while sleepy and traffic accidents related to sleepiness
155-158	Gender differences in incidence of insomnia and other sleep disorders
169	Gender and rate of metabolism of alcohol
169	Gender and binge drinking among college students
176	Gender differences in effects of MDMA (ecstasy) on the brain
186	Women as research assistants in Pavlov's laboratories
291-292	How the lack of a gender-neutral pronoun in English influences thinking
309	Test performance and the influence of gender stereotypes
308-309	Language, gender stereotypes, and gender bias
329-330	Gender differences in caloric intake and sedentary lifestyles
330	Gender differences in rates of overweight and obesity
329-330	Gender differences in activity level and metabolism
348	Gender similarities and differences in experience and expression of emotion
348	Gender differences in cultural display rules and emotional expression
363	Sex differences in genetic transmission of recessive characteristics
383	Gender differences in timing of the development of primary and secondary sex characteristics
385	Gender and accelerated puberty in father-absent homes
384-385	Gender differences in brain maturation
386	Gender differences in effects of early and late maturation
391-392	Gender differences in moral reasoning
392-393	Gender differences related to the end of reproductive capability
393	Gender differences in friendship patterns
394	Average age of first marriage and higher education attainment
395	Gender differences in single parent, head-of-household status
396-397	Gender and patterns of career development and parenting responsibilities
397	Gender differences in life expectancy
408-409	Definitions of gender, gender role, and gender identity
413	Gender differences in emotional expression
414-416	Gender stereotypes and gender roles
415-418	Sex differences in early childhood behavior
415-418	Development of gender identity and gender roles
416-418	Theories of gender-role development
416-418	Gender-identity development in Freud's psychoanalytic theory
419-420	Sex differences in the pattern of human sexual response
421-422	Sex differences in hormonal influences on sexual motivation
422	Gender differences in mate preferences
423-426	Sexual orientation
452-453	Social factors influencing gender preference for pink and blue in early childhood
452-453	Freud's contention of gender differences in resolving Oedipus complex
455	Sexual archetypes (anima, animus) in Jung's personality theory
456-457	Horney's critique of Freud's view of female psychosexual development
459	Critique of sexism in Freud's theory
498	Misleading effect of gender stereotypes
495	Gender similarities and differences in interpersonal attraction
508	Gender similarities in results of Milgram's obedience studies
531-532	Gender differences in frequency and source of daily hassles
548	Gender differences in susceptibility to the stress contagion effect
548-549	Gender differences in providing social support and effects of social support
551	Gender and social networks
551	Gender differences in responding to stress—the "tend-and-befriend" response
567	Gender differences in anxiety disorder
569-570	Gender differences in prevalence of phobias
570	Gender differences in prevalence of social phobia and *taijin kyofusho*
571-572	Gender differences in prevalence of post-traumatic stress disorder
577	Gender differences in prevalence of major depression and seasonal affective disorder
579	Lack of gender differences in prevalence of bipolar disorder
582-584	Gender differences in prevalence of eating disorders
586	Gender differences in incidence of paranoid personality disorder
586-587	Gender differences in incidence of antisocial personality disorder
588	Gender differences in incidence of borderline personality disorder
597-598	Paternal age and incidence of schizophrenia
602	Gender differences in number of suicide attempts and in number of suicide deaths
646	Gender differences in sexual contact between therapists and clients
B-12	Gender differences in reasons for wanting to telecommute

- Mirror Neurons: Imitation in the Brain?, p. 220
- Assembling Memories: Echoes and Reflections of Perception, p. 262
- Mapping Brain Changes in Alzheimer's Disease, p. 269
- Seeing Faces and Places in the Mind's Eye, p. 279
- Dopamine Receptors and Obesity, p. 331
- Emotions and the Brain, p. 343
- The Adolescent Brain: A Work in Progress, p. 384
- Boosting the Aging Brain, p. 399
- Romantic Love and the Brain, p. 427
- The Neuroscience of Personality: Brain Structure and the Big Five, p. 471
- Brain Reward When Making Eye Contact with Attractive People, p. 490
- The Mysterious Placebo Effect, p. 540
- The Hallucinating Brain, p. 593
- Schizophrenia: A Wildfire in the Brain, p. 599
- Comparing Psychotherapy and Antidepressant Medication, p. 642

Enhancing Well-Being with Psychology

Among all the sciences, psychology is unique in the degree to which it speaks to our daily lives and applies to everyday problems and concerns. The **Enhancing Well-Being with Psychology** feature at the end of each chapter presents the findings from psychological research that address a wide variety of problems and concerns. In each of these features, we present research-based information in a form that students can use to enhance everyday functioning. As you can see in the following list, topics range from improving self-control to overcoming insomnia:

- Psychology in the Media: Becoming an Informed Consumer, p. 38
- Maximizing Your Brain's Potential, p. 81
- Strategies to Control Pain, p. 128
- Stimulus Control Therapy for Insomnia, p. 178
- Using Learning Principles to Improve Self-Control, p. 226
- Superpower Memory in Minutes per Day!, p. 270
- A Workshop on Creativity, p. 312
- Turning Your Goals into Reality, p. 354
- Raising Psychologically Healthy Children, p. 401
- Men, Women, and Conflict: Bridging the Gender Gap, p. 438
- Possible Selves: Imagine the Possibilities, p. 479
- The Persuasion Game, p. 520
- Minimizing the Effects of Stress, p. 555
- Understanding and Helping to Prevent Suicide, p. 602
- What to Expect in Psychotherapy, p. 645

The Pedagogical System

The pedagogical system in *Psychology* was carefully designed to help students identify important information, test for retention, and learn how to learn. It is easily adaptable to an SQ3R approach, for those instructors who have had success with

that technique. As described in the following discussion, the different elements of this text form a pedagogical system that is very student friendly, straightforward, and effective.

We've found that it appeals to diverse students with varying academic and study skills, enhancing the learning process without being gimmicky or condescending. A special student preface titled **To the Student** on pages xlv to xlvii, immediately before Chapter 1, describes the complete pedagogical system and how students can make the most of it.

The pedagogical system has four main components: (1) Advance Organizers, (2) Concept Reviews, (3) Chapter Reviews, and (4) the *Psychology,* Sixth Edition, Web companion site. Major sections are introduced by an **Advance Organizer** that identifies the section's *Key Theme* followed by a bulleted list of *Key Questions.* Each Advance Organizer mentally primes the student for the important information that is to follow and does so in a way that encourages active learning. Students often struggle with trying to determine what's important to learn in a particular section or chapter. As a pedagogical technique, the Advance Organizer provides a guide that directs the student toward the most important ideas, concepts, and information in the section. It helps students identify main ideas and distinguish them from supporting evidence and examples.

The **Concept Reviews** encourage students to review and check their learning at appropriate points in the chapter. As you look through the text, you'll see that the Concept Reviews vary in format. They include multiple-choice, matching, short answer, and true-false questions. Many of the Concept Reviews are interactive exercises that help students transfer their learning to new situations or examples.

Several other in-chapter pedagogical aids support the Advance Organizers and Concept Reviews. A clearly identified **Chapter Outline** provides an overview of topics and organization. Within the chapter, **key terms** are set in boldfaced type and defined in the margin. *Pronunciation guides* are included for difficult or unfamiliar words. Because students often have trouble identifying the most important theorists and researchers, names of **key people** are set in boldface type within the chapter. We also provide a page-referenced list of key people and key terms at the end of each chapter.

Beyond the learning aids in the text, every new copy of *Psychology* can be packaged with the study materials available through the online PsychPortal or the print Study Guide written by Cornelius Rea, Douglas College. Supplementing these materials, the **Book Companion Web site** contains multiple review activities. Each chapter has *two 15-question self-scoring practice quizzes, flashcards for rehearsing key terms, two crossword puzzles,* and more. In addition to the companion Web site, the book is accompanied by some other premium Web materials including **PsychPortal,** which combines all the electronic resources available for the book (including the e-book, interactive activities, and quizzes). The book companion site can be accessed at **www.worthpublishers.com/hockenbury6e.**

The Teaching Package: Print Supplements

The comprehensive teaching package that accompanies *Psychology* is designed to help you save time and teach more effectively. Many elements of the supplements package will be particularly helpful to the new, adjunct, or part-time instructor. This superb teaching package, expanded in the sixth edition, includes the following elements:

- **Instructor's Resources and Binder,** prepared by Edna Ross, University of Louisville, with Skip Pollock, Mesa Community College; Claudia Cochran-Miller, El Paso Community College; Beth Finders, St. Charles Community College; Beverly Drinnin, Des Moines Area Community College; Wayne Hall, San Jacinto College-Central Campus; and Nancy Melucci, Los Angeles Community College District.

This edition will feature new activities submitted by Paul DeMarco, University of Louisville; Julie Gurner, Community College of Philadelphia; Anne McCrea, Sinclair Community College; and Rachel Rogers, Community College of Rhode Island. Arranged topically rather than by chapter for this edition, the Instructor's Resources include an abundance of materials to aid instructors in planning their courses, including classroom demonstrations and activities, student exercises, advice on teaching the nontraditional student, popular video suggestions, and "Psychology in the News" topics. The lecture guides will contain chapter objectives and outlines and suggestions on how to approach your lecture.

- **Test Bank,** written by Don and Sandra Hockenbury with the assistance of Cornelius Rea. This edition's test bank was expertly revised by Matthew Hilimire, Georgia Tech. This enhanced, printed Test Bank includes over 6,000 multiple-choice, true-false, and short-answer essay questions, plus Learning Objectives for each chapter that correspond to those in the Instructor's Resources. The Test Bank includes visual questions that you can include when generating and printing your tests. Each question is referenced to the textbook, identified as a factual/definitional or conceptual/analytical question, and keyed to a learning objective and an APA learning outcome.
- ***Diploma* Computerized Test Bank** This versatile dual-platform test-generating software allows instructors to edit, add, or scramble questions from the *Psychology,* Sixth Edition, Test Bank; format tests, drag-and-drop questions to create quizzes quickly and easily, and then print them for an exam. The computerized Test Bank will also allow instructors to export into a variety of formats that are compatible with many Internet-based testing products. For more information on *Diploma,* please visit Wimba's Web site: http://www.wimba.com/products/diploma
- **Study Guide for *Psychology,*** written by Cornelius Rea who taught psychology courses for many years at Simon Fraser University and Douglas College, and currently has a consulting business in West Vancouver, British Columbia, Canada. The Study Guide is carefully designed to help students understand text information and prepare for exams. Each chapter begins with At a Glance (which provides an overview of the chapter). Each Study Guide section includes a series of Preview Questions followed by fill-ins (some asking for lengthy responses). At the end of each Study Guide section is a Concept Check (application questions) followed by a Review of Key Terms, Concepts, and Names. The guide also contains Graphic Organizers, which encourage students to complete graphs, charts, and flow diagrams that ultimately provide a visual synopsis of text material. At the end of every Study Guide chapter are Something to Think About questions, which contain thought-provoking questions designed to encourage critical thinking and application of the material, followed by three Progress Tests. All answers are provided at the end of the chapter.
- ***Psychology: The Human Experience* Telecourse Student Guide,** written by Ken Hutchins, Orange Coast College, Costa Mesa, California. The Emmy award–winning Coast Learning System's telecourse, titled *Psychology: The Human Experience,* is based on *Psychology,* the designated text to accompany the telecourse. Ken Hutchins, Don Hockenbury, and Sandra Hockenbury were members of the Faculty Advisory Committee and were closely involved in the development of the telecourse. The Telecourse Student Guide by Ken Hutchins draws clear connections between the text and the telecourse, helping students to get the most out of the learning experience.
- **The *Scientific American* Psychology Reader** is a collection of articles selected from recent issues of *Scientific American* magazine. Each article is accompanied by an introduction and preview of each article, as well as a series of thoughtful discussion questions to encourage classroom discussions.
- ***Pursuing Human Strengths: A Positive Psychology Guide*** by Martin Bolt, Calvin College. Martin Bolt's new workbook aims to help students build up their strengths. Closely following the research, this book provides a brief overview of

nine positive traits, such as hope, self-respect, commitment, and joy. It also offers self-assessment activities that help students gauge how much of the trait they have developed and research-based suggestions for how they might work further toward fostering these traits.

- ***Critical Thinking Companion,* Second Edition** by Jane Halonen, University of West Florida, and Cynthia Gray, Alverno College. This engaging and challenging handbook includes exercises in pattern recognition, practical problem-solving, creative problem-solving, scientific problem-solving, psychological reasoning, and perspective-taking.

The Teaching Package: Media Supplements

- **PsychPortal** is a breakthrough online learning space created by psychologists for psychologists. Combining a powerful quizzing engine with unparalleled media resources, it contains all the functionality you expect from a site that can serve as an independent online course, but it is the core teaching and learning components that make PsychPortal truly unique. PsychPortal for *Psychology,* Sixth Edition is organized around these main components:
  - **New! LearningCurve** Combining adaptive question selection, personalized study plans, and state-of-the-art question analysis reports, LearningCurve provides students with a unique learning experience. LearningCurve quizzing activities have a game-like feel that keeps students engaged in the material while helping them learn key concepts.
  - **New! Launch Pad** Launch Pad offers a set of prebuilt assignments, carefully crafted by a group of instructional designers and instructors with an abundance of teaching experience as well as deep familiarity with Worth content. Each Launch Pad unit contains videos, activities, and formative assessment pieces to build student understanding for each topic, culminating with a randomized summative quiz to hold students accountable for the unit. Instructors can assign units in just a few clicks, with student responses reported into PsychPortal's gradebook.
  - **A Complete, Fully Interactive eBook of *Psychology,* Sixth Edition** Worth's eBooks integrate the complete text, a rich assortment of media-powered learning opportunities, and a variety of customization features for students and instructors. The platform was developed by Pepper Williams, a cognitive psychologist (Ph.D., Yale University) who taught undergraduate psychology at the University of Massachusetts. The eBook is also available as a stand-alone resource, giving students a low-cost alternative to purchasing the printed textbook. An eBook is also available through *CourseSmart.*
  - **Concepts in Action** Created by award-winning multimedia author Tom Ludwig and embedded throughout the eBook, these Flash-based activities help students solidify their understanding of key concepts as they encounter them in the text.
  - **An Assignment Center** PsychPortal's Assignment Center makes it easy for instructors to construct and administer tests and quizzes based on the book's Test Bank or their own questions. Instructors can use pre-created assignments or create their own, choosing from a question bank that includes every exercise from the textbook, along with hundreds of additional questions. Quizzes are randomized and timed, and instructors can receive summaries of student results in reports that follow the section order of the chapters.
  - **Course Materials** With more of Worth's premium resources than ever, this one-stop location provides quick access to all student and instructor media associated with the book—an extraordinary range of outstanding resources, including:
    - **Video Tool Kit Activities—Expanded!**

  - **PsychInvestigator—New to PsychPortal!**
  - **PsychSim 5.0**
  - **PsychInquiry**
  - **New! Worth Introductory Psychology Video Series, produced by Scientific American and Nature—30 clips!**
- **Complete customization** Every element of PsychPortal is customizable, from the arrangement of the home page to the assignment of eBook sections, to all forms of assessment. Instructors can:
  - Rearrange chapters or sections of the eBook—or replace chapters or sections with their own content.
  - Insert quizzes, discussion forums, uploaded files, or any content into eBook sections, Launch Pad units, or lessons of their own making.
  - Replace, supplement, or delete questions from the pre-made quizzes and homework assignments that come pre-packaged in the portal.
- **PsychInvestigator: Laboratory Learning in Introductory Psychology** by Arthur Kohn, Ph.D. Available within PsychPortal or as a stand-alone resource, this exciting Web-based product is a virtual laboratory environment that enables students to participate in real experiments that reinforce the most important concepts of the introductory psychology course. Students are introduced to psychological experiments in a dynamic environment featuring hosts video-streamed for the most realistic portrayal possible. In **PsychInvestigator,** students participate in classic psychology experiments, generate real data, and review the broader implications of those findings in psychological science. In each experiment, students participate in compelling video tutorials that are displayed before *and* after the actual experiment. PsychInvestigator requires no additional faculty time. Students' quiz scores can be automatically uploaded into an online grade book if instructors wish to monitor students' progress.
- The **Companion Web Site at** www.worthpublishers.com/hockenbury6e provides students with a free online study guide. Features include learning objectives, crossword puzzles, critical thinking activities, online quizzes, a Spanish/English glossary, and interactive Web activities. Instructors can access a wealth of teaching materials from PowerPoint slides to Clicker questions.
- **Instructor's CD-ROM** This CD-ROM includes pre-built PowerPoint presentations for each chapter, a digital library of photographs, figures, and tables from the text, and an electronic version of the Instructor's Resources and Lecture Guides.

The Teaching Package: Video Supplements

- **Worth Video Anthology for Introductory Psychology** Instructors can now access a "best of" collection that showcases the video series listed below. The Worth Video Anthology for Introductory Psychology is available on flash drive and closed-captioned DVD.
- **New! Worth Introductory Psychology Video Series** Produced by Worth Publishers, in conjunction with sister companies Scientific American and Nature, this breakthrough collection of new modular tutorial videos explores core psychology topics. It includes 30 short films, each approximately 8 minutes in length. Authoritative, engaging, and beautifully realized, the collection includes animations, interviews with top scientists, and carefully selected archival footage, all focused on helping students understand everything from classical conditioning to cognitive dissonance. Although it is housed primarily in the Worth Video

Anthology, instructors may also request this collection on its own, either on a flash drive or closed-captioned DVD.

- **Worth Publishers Video Tool Kit for Introductory Psychology** With its superb collection of 160 brief (1 to 13 minutes) clips, the Video Tool Kit for Introductory Psychology gives students a fresh new way to experience both the classic experiments at the heart of psychological science and cutting-edge research conducted by the field's most influential investigators. Available at www.worthvideotoolkit.com, the site enables you to create gradable, reportable video assignments for your students that you can customize by adding notes and open-ended questions, and assigning star ratings. These videos are also available to instructors on CD-ROM and closed-captioned DVD. Instructors using the CD can easily import videos into their interactive presentation slides and the accompanying faculty guide includes step-by-step importation instructions for users of different platforms. The accompanying faculty guide is by Martin Bolt, Calvin College. A subset of the videos (110) is available on a non-reportable DVD for students who lack Internet connectivity or have bandwidth issues.
- **Scientific American Frontiers Teaching Modules, Third Edition** Edited by Martin Bolt, this collection offers 15 clips from *Scientific American Frontiers* segments produced between 2003 and 2005. Footage includes Phineas Gage Revisited, Understanding Autism, and Therapeutic Effectiveness.
- **Worth Digital Media Archive First and Second Editions (CD-ROM, DVD)** contains a rich collection of 75 digitized video clips of classic experiments and research. Footage includes Albert Bandura's Bobo doll experiment, Harold Takooshian's bystander studies, Piaget's conservation experiment, electrical brain stimulation, Harry Harlow's monkey experiments, Stanley Milgram's obedience study, and Ulric Neisser's selective attention studies.

Presentation

- **Interactive Presentation Slides for Introductory Psychology** This extraordinary series of "next-generation" Interactive Presentation Lectures give instructors a dynamic, yet easy-to-use new way to engage students during classroom presentations of core psychology topics. Each lecture provides opportunities for discussion and interaction, and enlivens the psychology classroom with an unprecedented number of embedded video clips and animations (including activities from Worth's ActivePsych). Each Interactive Presentation Lecture features:
  - Embedded videos
  - A number of activities
  - Ready-to-use clicker questions
  - Vivid images
- Worth's Interactive PowerPoint® Lectures for Introductory Psychology, available in two volumes on preloaded flash drives
- **ActivePsych: Classroom Activities Projects and Video Teaching Modules** offers tools to make class presentations more interactive. This set of instructor presentation CD-ROMs includes interactive flash and slides, and video clips from *Scientific American Frontiers* and various archival sources. *ActivePsych* video clips are available on CD, DVD, and VHS.

Acknowledgments

Many talented people contributed to this project. First, we would like to thank contributor Loren Toussaint, Luther College, for his many helpful suggestions, feedback on graphics and design, and constructive input at several stages during the production of this edition. Loren's enthusiasm, expertise, and hard work were invaluable in the preparation of this edition.

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As colleagues who care as much as we do about teaching, they have our gratitude for their hard work and commitment to excellence.

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Our colleagues and fellow Tulsa Community College psychology faculty—especially Phoebe Baker, Cathy Furlong, John Hensley, Susan Kamphaus, Fern Marrs, Alicia MacKay, Chrystie Meziere, and Krena White—continue to inspire us with their dedication to excellence in teaching. A special note of appreciation also goes to Sandra Massey, Northeast Campus Provost, Jocelyn Whitney, Liberal Arts Associate Dean, and the outstanding faculty who comprise the TCC Northeast Campus Liberal Arts and Human Services Department.

Worth Publishers

The remarkable people who make up Worth Publishers have a well-earned reputation for producing college textbooks and supplements of the highest quality. Special thanks to our executive editor, Jessica Bayne, for her leadership, creativity, and unfailing support of our project, always with a human touch. Jessica, we couldn't have done it without you! Next up is our developmental editor, Marna Miller (aka "Wonder Woman") whose talent, dedication, and unflappable good humor are truly remarkable. Marna is more than "just" a gifted editor—she is a wonderful human being. Thanks also go to assistant editor Lukia Kliossis, who expertly and cheerfully kept track of countless details, stacks of paper, and electronic files. The incredible new design for the sixth edition reflects the creative talents of art director and artist Babs Reingold. We never cease to be impressed by designer Lee Ann McKevitt's ability to create the seamless interaction of text, graphics, boxes, and features that you see on every page of *Psychology*. The text's beautiful layout also owes a great deal to the talented efforts of Lyndall Culbertson. The stunning graphics of this edition represent the combined talents of illustrator Todd Buck, Worth photo editor Christine Buese, and photo researcher Jacqueline Wong, whose creative efforts to find just the right image are greatly appreciated.

By any standard, director of development for print and digital projects Tracey Kuehn is an unbelievably talented and dedicated person. For the last five editions, Tracey's expertise, creativity, and delightful sense of humor have kept our project — and us — on track. With the help of project editor Robert Errera, Tracey effectively tackled and resolved the inevitable problems that accompany a project of this complexity. Our heartfelt thanks also to Barbara Seixas who coordinated a bewildering array of technical details to bring the book to press.

Perhaps the greatest unsung heroes in college textbook publishing are the supplements and media editors. At Worth Publishers, those editors work tirelessly to set the standard by which all other publishers are judged. With conscientious attention to a multitude of details, Christine Burak, Stacey Alexander, Lukia Kliossis, and Betty Probert have expertly assembled the integrated program of print, video, and Internet supplements that accompanies our text. They are awesome!

Psychology marketing manager Lindsay Johnson helped launch the sixth edition with her expertly coordinated advertising, marketing, and sales support efforts. Special thanks to our longtime friend and adopted family member, Steve Patrick, Southwest Regional Manager.

A few personal acknowledgements are in order. Several friends and family members kindly allowed us to share their stories with you. Sadly, Fern, Erv, and Ken are no longer with us, but they live on in our memories, as well as in the personal stories that we continue to tell about them. We deeply miss Fern and Erv's unflagging

support, and the kindness, love, and seemingly endless supply of funny stories that we so relied on over the years of writing and revising the five previous editions of *Psychology* and *Discovering Psychology*. We also thank Bob and Tom, Janeen and Marty, Terry and Jean, Judylynn, Zak, Josh, Jordon, Katie, and all the other members of our extended family for their support and encouragement. We are grateful to our good friends Andi, Hawk, and Wyncia; Asha and Paul; Tom and Lynn, and their children, Will, and Lily; and especially Marcia, for allowing us to tell their stories in our book. Had Richard lived to see the publication of *Psychology,* we know he would have been proud to be part of its pages.

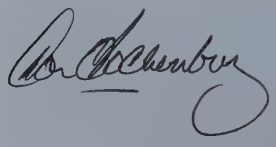
Finally, our daughter Laura has lived with this project since she was born. Laura is a senior geology major at Carleton College in Northfield, Minnesota. Like her parents, Laura has wide-ranging interests, ranging from sustainable development and climate change to alternative energy, wilderness medicine, and the arts. An accomplished classical and improvisational pianist, she is also co-director of Lenny Dee, Carleton's sketch comedy troupe and a member of Eclipse, the 2011 Division III National Ultimate Frisbee champions. Thank you for your idealism, your generous spirit, and for being true to yourself. Wherever you go, Laura, go with all your heart!

An Invitation

We hope that you will let us know how you and your students like the sixth edition of *Psychology*. And, as always, we welcome your thoughts, comments, and suggestions. You can write to us in care of Worth Publishers, 41 Madison Avenue, 35th Floor, New York, NY 10010, or contact us via e-mail at: **Hockenbury.Psychology@gmail.com.**

Above all, we hope that your class is an enjoyable and successful one as you introduce your students to the most fascinating and personally relevant science that exists.

With best wishes to you and your students,





To the Student

Learning from *Psychology*

Welcome to psychology! Our names are **Don and Sandy Hockenbury,** and we're the authors of your textbook. Every semester we teach several sections of introductory psychology. We wrote this text to help you succeed in the class you are taking. Every aspect of this book has been carefully designed to help you get the most out of your introductory psychology course. Before you begin reading, you will find it well worth your time to take a few minutes to familiarize yourself with the special features and learning aids in this book.

Learning Aids in the Text

KEY THEME

› You can enhance your chances for success in psychology by using the learning aids that have been built into this textbook.

KEY QUESTIONS

› What are the functions of the Prologue, Advance Organizers, Key Terms, Key People, and Concept Reviews?

› What are the functions of the different types of boxes in this text, and why should you read them?

› Where can you go to access a virtual study guide at any time of the day or night, and what study aids are provided?

First, take a look at the **Chapter Outline** at the beginning of each chapter. The Chapter Outline provides an overview of the main topics that will be covered in the chapter. You might also want to flip through the chapter and browse a bit so you have an idea of what's to come.

Next, read the chapter **Prologue.** The Prologue is a true story about real people. Some of the stories are humorous, some dramatic. We think you will enjoy this special feature, but it will also help you to understand the material in the chapter that follows and why the topics are important and relevant to your life.

The Prologue will help you relate the new information in this book to experiences that are already familiar to you. In each chapter, we return to the people and stories introduced in the Prologue to illustrate important themes and concepts.

As you begin reading the chapter, you will notice several special elements. **Major Sections** are easy to identify because the heading is in red type. The beginning of each major section also includes an **Advance Organizer**—a short section preview that looks like the one above.

The Key Theme provides you with a preview of the material in the section to come. The **Key Questions** will help you focus on some of the most important material in the section. Keep the questions in mind as you read the section. They will help you identify important points in the chapter. After you finish reading each section, look again at the Advance Organizer. Make sure that you can confidently answer each question before you go on to the next section. If you want to maximize your understanding of the material, write out the answer to each question. You can also use the questions in the Advance Organizer to aid you in taking notes or in outlining chapter sections, both of which are effective study strategies.

Notice that some terms in the chapter are printed in **boldface,** or darker, type. Some of these **key terms** may already be familiar to you, but most will be new. The dark type signals that the term has a specialized meaning in psychology. Each key term is formally defined within a sentence or two of being introduced. The key terms are also defined in the margins, usually on the page on which they appear in the text. Some key terms include a **pronunciation guide** to help you say the word correctly.

Occasionally, we print words in *italic type* to signal either that they are boldfaced terms in another chapter or that they are specialized terms in psychology.

Certain names also appear in boldface type. These are the **key people**—the researchers or theorists who are especially important within a given area of psychological study. Typically, key people are the psychologists or other researchers whose names your instructor will expect you to know.

A Concept Review appears several times in every chapter. The Concept Reviews contain exercises that allow you to check your understanding of important information. Answer the questions by filling in the blanks or by circling the correct answer. Then check your work against the correct answers provided at the end of each chapter.

Reviewing for Examinations

The **Chapter Review** at the end of each chapter includes several elements to help you review what you have learned. The chapter's **key points** are summarized and bulleted under each major section heading. All the chapter's **key people** and **key terms** are listed, along with the pages on which they appear and are defined. The key terms are also boldfaced in the chapter summary so you can see their use in context. You can check your knowledge of the key people by describing in your own words why each scientist is important. You will also want to define each key term in your own words, then compare your definition to information on the page where it is discussed.

Special Features in the Text

Each chapter in *Psychology* has several boxes that focus on different kinds of topics. Take the time to read the boxes because they are an integral part of each chapter. They also present important information that you may be expected to know for class discussion or tests. There are five types of boxes:

- **Critical Thinking** boxes ask you to stretch your mind a bit by presenting issues that are provocative or controversial. They will help you actively question the implications of the material that you are learning.
- **Science Versus Pseudoscience** boxes examine the evidence for various popular pseudosciences—from subliminal persuasion to astrology. These discussions will help teach you how to think scientifically and critically evaluate claims.
- **Culture and Human Behavior** boxes are another special feature of this text. Many students are unaware of the importance of cross-cultural research in contemporary psychology. These boxes highlight cultural differences in thinking and behavior. They will also sensitize you to the ways in which people's behavior, including your own, has been influenced by cultural factors.
- **In Focus** boxes present interesting information or research. Think of them as sidebar discussions. They deal with topics as diverse as human pheromones, whether animals dream, and why snakes give so many people the creeps.
- **Focus on Neuroscience** sections provide clear explanations of intriguing studies that use brain-imaging techniques to study psychological processes. Among the topics that are highlighted: schizophrenic hallucinations, mental images, drug addiction, and romantic love and the brain.

The **Enhancing Well-Being with Psychology** application at the end of each chapter provides specific suggestions to help you deal with real-life concerns. These suggestions are based on psychological research, rather than opinions, anecdotes, or pop psych self-help philosophies. The Enhancing Well-Being sections show you how psychology can be applied to a wide variety of everyday concerns. We hope that these sections make a difference in your life. Because the Enhancing Well-Being sections for Chapters 5, 6, and 8 deal with setting and achieving goals and enhancing motivation and memory, you may want to skip ahead and read them after you finish this student preface.

There are two special appendices at the back of the text. The **Statistics: Understanding Data** appendix discusses how psychologists use statistics to summarize and draw conclusions from the data they have gathered. The **Industrial/Organizational Psychology** appendix describes the branch of psychology that studies human behavior in the workplace. Your instructor may assign one or both of these appendices, or you may want to read them on your own.

Also at the back of this text is a **Glossary** containing the definitions for all **key terms** in the book and the pages on which they are discussed in more detail. You can use the **Subject Index** to locate discussions of particular topics and the **Name Index** to locate particular researchers. Finally, interested students can look up the specific studies we cite in the **References** sections.

The *Psychology* Web Companion Site

The *Psychology* Web Companion site is the home of Worth's free virtual study aids and supplemental content. You can access the companion Web site at: **www.worthpublishers.com/hockenbury6e**

Below are some suggestions for how you can use those resources to your advantage.

- Print the **Learning Objectives** to provide a detailed list of the information that you should master for each chapter.
- Take the self-scoring **quizzes** and use the **flashcards** to test yourself on the key terms and key people. The Web site also offers a Spanish language version of the flashcards.
- Use the **crossword puzzles** as a fun way to test your knowledge of key terms and key people. There are two crossword puzzles for each chapter and one for each appendix.
- **Animations** will help you apply and reinforce your understanding of important chapter concepts.
- **Psych2Go** provides you with the opportunity to purchase podcasts of chapter reviews, quizzes, and flashcards in an easily downloadable format. Find out more at www.psych2go.com.

The Study Guide

Beyond the learning aids contained in each chapter and on the online resources for *Psychology,* we also highly recommend the excellent **Study Guide** that accompanies this text. The guide was written by our colleague Cornelius Rea, who taught psychology courses for many years at Simon Fraser University and Douglas College, and currently has a consulting business in West Vancouver, British Columbia, Canada. You can order a Study Guide through your bookstore or online through Worth Publishers.

That's it! We hope you enjoy reading and learning from the sixth edition of *Psychology.* If you want to share your thoughts or suggestions for the next edition of this book, you can write to us at the following address:

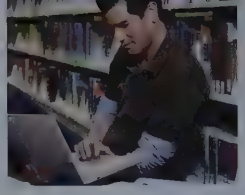
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Have a great class!



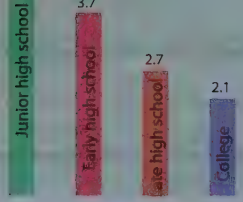


CHAPTER 1

Introduction and Research Methods







Miracle Magnets?

PROLOGUE

YOU DON'T NEED TO BE A PSYCHOLOGIST to notice that every class has its own collective personality. In our 11 o'clock introductory psychology class during this particular semester, multiple personalities emerged as the students quickly segregated themselves by age and life experiences.

The younger students were a hodgepodge of languages, ethnic groups, hair styles, tattoos, and piercings. Best described as boisterous bordering on rowdy, this crew clustered together on the right side of the classroom and regularly asked interesting (and sometimes off-the-wall) questions.

Grouped on the left side of the class were seven middle-aged adult students. Although they occasionally spoke up in class, they were fairly reserved. Two of the guys were laid-off workers training for new jobs. And there were three women who were back in school now that their children were older. Brenda was one of them.

Lingering after class one day, Brenda asked if Don had time to talk. "Do you know anything about magnet therapy for psychological disorders?" she asked.

"I know a little about the research on transcranial magnetic stimulation, if that's what you're asking about," Don responded. Brenda looked puzzled.

"It's abbreviated TMS," Don explained. "It's a procedure that uses powerful electromagnetic fields to stimulate the brain. The device looks kind of like two big, flat donuts side by side on a wand. They set the thing on a person's skull and the magnetic coils inside generate magnetic fields."

"So it's not like a regular magnet?" Brenda asked.

"Oh, no. Not at all. The device is actually an electromagnet. It needs electricity to generate the magnetic field."

"Can it be used for schizophrenia?"

"TMS? From what I've read, TMS is used to treat depression. My understanding is that it's still experimental. I can find out more about it if you want."

"What about magnetic vests? Could something like this be used to treat schizophrenia?" Brenda asked, unfolding a piece of paper and handing it to Don. It was an ad for a cloth vest with 48 magnets sewn into the front and back lining. The ad was cluttered with quotes from people who claimed that the vest had improved their athletic ability or relieved pain or other symptoms.

"Wow, forty-eight magnets. That must be incredibly heavy to wear," Don commented as he studied the ad. "I don't mean to pry, Brenda, but can I ask why you're asking about this?"

Brenda glanced around the classroom, checking to make sure no one else was listening to the conversation. "I have a son named Adam. He was diagnosed with schizophrenia about three years ago, just after his thirteenth birthday," she explained.

IN THIS CHAPTER:

- Introduction: The Origins of Psychology
- Contemporary Psychology
- The Scientific Method
- Descriptive Research Methods
- The Experimental Method
- Ethics in Psychological Research
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Psychology in the Media: Becoming an Informed Consumer

"There's a therapist who works with Adam's psychiatrist who told us to buy this magnetic vest. She said the magnets will help treat Adam's schizophrenia."

"Really? How is it supposed to help?"

"I don't understand it," Brenda admitted. "But my son has been wearing the magnetic vest for the last two weeks, even at school. It cost about $250, and he hates it! It's heavy and hot and it makes his skin itch. The therapist wants us to buy a magnetic mattress that costs about a thousand dollars. That's a lot of money in our household. Do you think it might help?"

"I've never heard of such a thing," Don replied cautiously. "Is the vest helping?"

"It doesn't seem to be," Brenda answered, frowning. "But the therapist said we need to give it time. She said she's seen the magnetic mattress work miracles with some of her patients. And my neighbor swears that his arthritis is much better since he started wearing magnetic bracelets."

"Miracles, huh? Honestly, Brenda, I'm not aware of any research about using regular magnets to treat schizophrenia or any other psychological disorder. Then again, this could be something that slipped by both me and Sandy. Let me scan the research this weekend, and we'll talk on Monday," Don said.

Later in the chapter, we'll share what we found out about magnet therapy.

Like Brenda, many of our students respond personally to the topics we cover in our introductory psychology class. As teachers and authors, we've found that building on the many links between psychological knowledge and our students' personal experiences is a very effective way to learn about psychology. Our goal is to build a conceptual bridge between your existing knowledge and new ways of understanding your experiences.

In this introductory chapter, Brenda's question will help us establish some important foundations and themes for the rest of the text. You'll see how psychology evolved into a very diverse science that studies many different areas of human and animal experience. The common theme connecting psychology's varied topics is its reliance on a solid foundation of scientific evidence. By the end of the chapter, you'll have a better appreciation of the scientific methods that psychologists use to answer questions, big and small, about behavior and mental processes.

Welcome to psychology!



Introduction: The Origins of Psychology

KEY THEME

› Today, psychology is defined as the science of behavior and mental processes, a definition that reflects psychology's origins and history.

KEY QUESTIONS

› What roles did Wundt and James play in establishing psychology?

› What were the early schools and approaches in psychology, and how did their views differ?

We begin this introductory chapter by stepping backward in time to answer several important questions: How did psychology begin? When did psychology begin? Who founded psychology as a science?

It's important to consider these historical issues for several reasons. First, students are often surprised at the wide range of topics studied by contemporary psychologists.

Those topics can range from the behavior of a single brain cell to the behavior of people in groups, from prenatal development to old age, and from normal behavior



AP Photo/Fabian Bimmer

What Do Psychologists Study?
Conformity and confrontation. Friendliness and fear. Private thoughts, public behavior. These are just a few of the wide range of topics studied in *psychology*, the science of behavior and mental processes. But whether psychologists study the behavior of a single brain cell or the behavior of a crowd of people, they rely on the scientific method to guide their investigations.

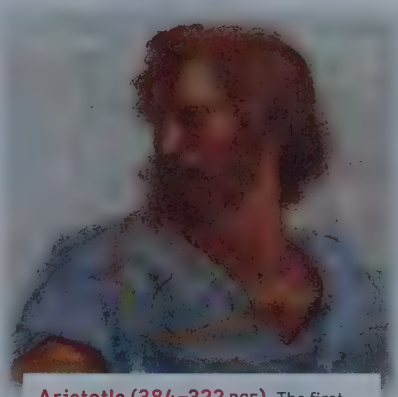
and mental processes to severely maladaptive behavior and mental processes. As you become familiar with how psychology began and developed, you'll have a better appreciation for how it has come to encompass such diverse subjects.

Second, you need to understand how the definition of **psychology** has evolved over the past 130 years to what it is today—*the scientific study of behavior and mental processes.* Indeed, the early history of psychology is the history of a field struggling to define itself as a separate and unique scientific discipline. The early psychologists struggled with such fundamental issues as:

- How should psychology be defined?
- What is the proper subject matter of psychology?
- Which areas of human experience should be studied?
- What methods should be used to investigate psychological issues?
- Should psychology include the study of nonhuman animal behavior?
- Should psychological findings be used to change or enhance human behavior?

These debates helped set the tone of the new science, define its scope, and set its limits. Over the past century, the shifting focus of these debates has influenced the topics studied and the research methods used.

■ **psychology** The scientific study of behavior and mental processes.



Ted Spiegel/Corbis

Aristotle (384–322 BCE) The first western thinker to study psychological topics, Aristotle combined the logic of philosophy with empirical observation. His best known psychological work, *De Anima*, is regarded as the first systematic treatise on psychology. Its topics included such basic psychological processes as the senses, perception, memory, thinking, and motivation. Aristotle's writings on psychology anticipated topics and theories that would be central to scientific psychology centuries later.

The Influence of Philosophy and Physiology

The earliest origins of psychology can be traced back several centuries to the writings of the great philosophers. More than 2,000 years ago, the Greek philosopher Aristotle wrote extensively about topics like sleep, dreams, the senses, and memory. He also described the traits and dispositions of different animals. Many of Aristotle's ideas remained influential until the beginnings of modern science in the seventeenth century (Kheriaty, 2007).

At that time, the French philosopher René Descartes (1596–1650) proposed a doctrine called *interactive dualism*—the idea that mind and body were separate entities that interact to produce sensations, emotions, and other conscious experiences. Today, psychologists continue to explore the relationship between mental activity and the brain.

Philosophers also laid the groundwork for another issue that would become central to psychology—the *nature–nurture issue.* For centuries, philosophers debated which was more important: the inborn *nature* of the individual or the environmental influences that *nurture* the individual. This debate was sometimes framed as nature *versus* nurture. Today, however, psychologists acknowledge the importance of both nature *and* nurture. Many psychologists still actively investigate the relative influences of *heredity versus environmental factors* on behavior (Sameroff, 2010). However, today's researchers also focus on studying the dynamic *interaction* between environmental factors and genetic heritage (Meaney, 2010).

Such philosophical discussions influenced the topics that would be considered in psychology. But the early philosophers could advance the understanding of human behavior only to a certain point. Their methods were limited to intuition, observation, and logic.

The eventual emergence of psychology as a science hinged on advances in other sciences, particularly physiology. *Physiology* is a branch of biology that studies the functions and parts of living organisms, including humans. In the 1600s, physiologists were becoming interested in the human brain and its relation to behavior. By the early 1700s, it was discovered that damage to one side of the brain produced a loss of function in the opposite side of the body. By the early 1800s, the idea that different brain areas were related to different behavioral functions was being vigorously debated. Collectively, the early scientific discoveries made by physiologists were establishing the foundation for an idea that was to prove critical to the emergence of psychology—namely, that scientific methods could be applied to answering questions about behavior and mental processes.



Blend Images/Alamy

Nature or Nurture? Both father and son are clearly enjoying the experience of drawing together. Is the child's interest in art an expression of his natural tendencies, or is it the result of his father's encouragement and teaching? Originally debated by philosophers hundreds of years ago, the relationship between heredity and environmental factors continues to interest psychologists today.



Corbis

Wilhelm Wundt (1832–1920)
German physiologist Wilhelm Wundt is generally credited as being the founder of psychology as an experimental science. In 1879, he established the first psychology research laboratory. By the early 1900s, Wundt's research had expanded to include such topics as cultural psychology and developmental psychology.

Wilhelm Wundt

The Founder of Psychology

By the second half of the 1800s, the stage had been set for the emergence of psychology as a distinct scientific discipline. The leading proponent of this idea was a German physiologist named **Wilhelm Wundt** (Gentile & Miller, 2009). Wundt used scientific methods to study fundamental psychological processes, such as mental reaction times in response to visual or auditory stimuli. For example, Wundt tried to measure precisely how long it took a person to consciously detect the sight and sound of a bell being struck.

A major turning point in psychology occurred in 1874, when Wundt published his landmark text, *Principles of Physiological Psychology* (Diamond, 2001). In this book, Wundt outlined the connections between physiology and psychology. He also promoted his belief that psychology should be established as a separate scientific discipline that would use experimental methods to study mental processes. A few years later, in 1879, Wundt realized that goal when he opened the first psychology research laboratory at the University of Leipzig. Many regard this event as marking the formal beginning of psychology as an experimental science (Kohls & Benedikter, 2010).

Wundt defined psychology as the study of consciousness and emphasized the use of experimental methods to study and measure consciousness. Later, he devoted himself to the study of social and cultural influences on mental life, which he called "Folk Psychology" (Wong, 2009). Until he died in 1920, Wundt exerted a strong influence on the development of psychology as a science. Two hundred students from around the world, including many from the United States, traveled to Leipzig to earn doctorates in experimental psychology under Wundt's direction. Over the years, some 17,000 students attended Wundt's afternoon lectures on general psychology, which often included demonstrations of devices he had developed to measure mental processes (Blumenthal, 1998).



Edward B. Titchener (1867–1927)
In contrast to the psychology programs at both Harvard and Columbia Universities at the time, Edward Titchener welcomed women into his graduate program at Cornell. In fact, more women completed their psychology doctorates under Titchener's direction than under any other male psychologist of his generation (Evans, 1991).

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Edward B. Titchener

Structuralism

One of Wundt's most devoted students was a young Englishman named **Edward B. Titchener.** After earning his psychology doctorate in Wundt's laboratory in 1892, Titchener accepted a position at Cornell University in Ithaca, New York. There he established a psychology laboratory that ultimately spanned 26 rooms.

Titchener shared many of Wundt's ideas about the nature of psychology. Eventually, however, Titchener developed his own approach, which he called *structuralism*. **Structuralism** became the first major school of thought in psychology. Structuralism held that even our most complex conscious experiences could be broken down into elemental *structures,* or component parts, of sensations and feelings. To identify these structures of conscious thought, Titchener trained subjects in a procedure called *introspection*. The subjects would view a simple stimulus, such as a book, and then try to reconstruct their sensations and feelings immediately after viewing it. (In psychology, a *stimulus* is anything perceptible to the senses, such as a sight, sound, smell, touch, or taste.) They might first report on the colors they saw, then the smells, and so on, in the attempt to create a total description of their conscious experience (Titchener, 1896/2009).

In addition to being distinguished as the first school of thought in early psychology, Titchener's structuralism holds the dubious distinction of being the first school to disappear. With Titchener's death in 1927, structuralism as an influential school of thought in psychology essentially ended. But even before Titchener's death, structuralism was often criticized for relying too heavily on the method of introspection.

As noted by Wundt and other scientists, introspection had significant limitations. First, introspection was an unreliable method of investigation. Different subjects often provided very different introspective reports about the same stimulus. Even

subjects well trained in introspection varied in their responses to the same stimulus from trial to trial.

Second, introspection could not be used to study children or animals. Third, complex topics, such as learning, development, mental disorders, and personality, could not be investigated using introspection. In the end, the methods and goals of structuralism were simply too limited to accommodate the rapidly expanding interests of the field of psychology.

- **structuralism** Early school of psychology that emphasized studying the most basic components, or structures, of conscious experiences.
- **functionalism** Early school of psychology that emphasized studying the purpose, or function, of behavior and mental experiences.

William James

Functionalism

By the time Titchener arrived at Cornell University, psychology was already well established in the United States. The main proponent of American psychology was one of Harvard's most outstanding teachers—**William James.** James had become intrigued by the emerging science of psychology after reading one of Wundt's articles, "Recent Advances in the Field of Physiological Psychology," in the late 1860s. But there were other influences on the development of James's thinking.

Like many other scientists and philosophers of his generation, James was fascinated by the idea that different species had evolved over time (Menand, 2001). Many nineteenth-century scientists in England, France, and the United States were evolutionists—that is, they believed that species had not been created once and for all, but had changed over time (Caton, 2007).

In the 1850s, British philosopher Herbert Spencer had published several works arguing that modern species, including humans, were the result of gradual evolutionary change. In 1859, **Charles Darwin's** groundbreaking work, *On the Origin of Species*, was published. James and his fellow thinkers actively debated the notion of evolution, which came to have a profound influence on James's ideas (Richardson, 2006). Like Darwin, James stressed the importance of adaptation to environmental challenges.

In the early 1870s, James began teaching a physiology and anatomy class at Harvard University. An intense, enthusiastic teacher, James was prone to changing the subject matter of his classes as his own interests changed (B. Ross, 1991). Gradually, his lectures came to focus more on psychology than on physiology. By the late 1870s, James was teaching classes devoted exclusively to the topic of psychology.

At about the same time, James began writing a comprehensive textbook of psychology, a task that would take him more than a decade. James's *Principles of Psychology* was finally published in two volumes in 1890. Despite its length of more than 1,400 pages, *Principles of Psychology* quickly became the leading psychology textbook. In it, James discussed such diverse topics as brain function, habit, memory, sensation, perception, and emotion. James's views had an enormous impact on the development of psychology in the United States.

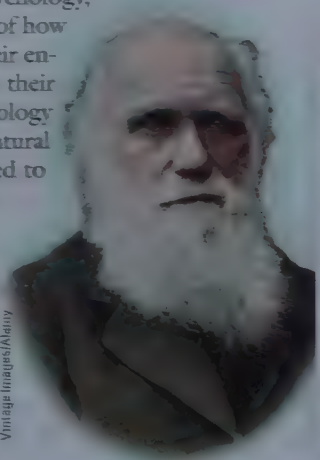
James's ideas became the basis for a new school of psychology, called functionalism. **Functionalism** stressed the importance of how behavior *functions* to allow people and animals to adapt to their environments. Unlike structuralists, functionalists did not limit their methods to introspection. They expanded the scope of psychology research to include direct observation of living creatures in natural settings. They also examined how psychology could be applied to areas like education, child rearing, and the work environment.

Both the structuralists and the functionalists thought that psychology should focus on the study of conscious experiences. But the functionalists had very different ideas about the nature of consciousness and how it should be studied. Rather than trying to identify the essential structures of consciousness at a given moment, James saw consciousness as an ongoing stream of mental activity that shifts and changes.



Corbis

William James (1842–1910)
Harvard professor William James was instrumental in establishing psychology in the United States. James's ideas became the basis of another early school of psychology, called *functionalism*, which stressed studying the adaptive and practical functions of human behavior.



Vintage Images/Alamy

Charles Darwin (1809–1882)
Naturalist Charles Darwin had a profound influence on the early development of psychology. Darwin was not the first scientist to propose that complex organisms evolved from simpler species (Caton, 2007). However, Darwin's book, *On the Origin of Species*, published in 1859, gathered evidence from many different scientific fields to present a readable, compelling account of evolution through the mechanism of natural selection. Darwin's ideas have had a lasting impact on scientific thought (Dickins, 2011; Pagel, 2009).

As James wrote in *Talks to Teachers* (1899):

> Now the *immediate* fact which psychology, the science of mind, has to study is also the most general fact. It is the fact that in each of us, when awake (and often when asleep), *some kind of consciousness is always going on.* There is a stream, a succession of states, or waves, or fields (or whatever you please to call them), of knowledge, of feeling, of desire, of deliberation, etc., that constantly pass and repass, and that constitute our inner life. The existence of this is the primal fact, [and] the nature and origin of it form the essential problem, of our science.

Like structuralism, functionalism no longer exists as a distinct school of thought in contemporary psychology. Nevertheless, functionalism's twin themes of the importance of the adaptive role of behavior and the application of psychology to enhance human behavior continue to be evident in modern psychology.



Corbis

G. Stanley Hall (1844–1924)
G. Stanley Hall helped organize psychology in the United States. Among his many achievements was the establishment of the first psychology research laboratory in the United States and founded the American Psychological Association.

William James and His Students

Like Wundt, James profoundly influenced psychology through his students, many of whom became prominent American psychologists. Two of James's most notable students were G. Stanley Hall and Mary Whiton Calkins.

In 1878, **G. Stanley Hall** received the first Ph.D. in psychology awarded in the United States. Hall founded the first psychology research laboratory in the United States at Johns Hopkins University in 1883. He also began publishing the *American Journal of Psychology,* the first U.S. journal devoted to psychology. Most important, in 1892, Hall founded the American Psychological Association and was elected its first president (Arnett & Cravens, 2006). Today, the American Psychological Association (APA) is the world's largest professional organization of psychologists, with approximately 150,000 members.

In 1890, **Mary Whiton Calkins** was assigned the task of teaching experimental psychology at a new women's college—Wellesley College. Calkins studied with James at nearby Harvard University. She completed all the requirements for a Ph.D. in psychology. However, Harvard refused to grant her the Ph.D. degree because she was a woman and at the time Harvard was not a coeducational institution (Pickren & Rutherford, 2010).

Although never awarded the degree she had earned, Calkins made several notable contributions to psychology. She conducted research in many areas, including dreams, memory, and personality. In 1891, she established a psychological laboratory at Wellesley College. At the turn of the twentieth century, she wrote a well-received textbook, titled *Introduction to Psychology.* In 1905, Calkins was elected president of the American Psychological Association—the first woman, but not the last, to hold that position.

Just for the record, the first American woman to earn an official Ph.D. in psychology was **Margaret Floy Washburn.** Washburn was Edward Titchener's first doctoral student at Cornell University. She strongly advocated the scientific study of the mental processes of different animal species. In 1908, she published an influential text, titled *The Animal Mind.* Her book summarized research on sensation, perception, learning, and other "inner experiences" of different animal species. In 1921, Washburn became the second woman elected president of the American Psychological Association (Viney & Burlingame-Lee, 2003).

Finally, one of G. Stanley Hall's notable students was **Francis C. Sumner** (1895–1954). A brilliant student, Sumner was the first African American to receive a Ph.D. in psychology, awarded by Clark University in 1920. After teaching at several southern universities, Sumner moved to Howard University in Washington, D.C. At Howard he published papers on a wide variety of topics and chaired a psychology department that produced more African American psychologists than all other American colleges and universities combined (Guthrie, 2000, 2004). One of Sumner's most famous students was Kenneth Bancroft Clark. Clark's research on the negative effects of discrimination was instrumental in the U.S. Supreme Court's 1954 decision to end segregated schools (Jackson, 2006). In 1970, Clark became the first African American president of the American Psychological Association (Belgrave & Allison, 2010).

psychoanalysis Personality theory and form of psychotherapy that emphasizes the role of unconscious factors in personality and behavior.



Mary Whiton Calkins (1863–1930) Under the direction of William James, Mary Whiton Calkins completed all the requirements for a Ph.D. in psychology. Calkins had a distinguished professional career. She established a psychology laboratory at Wellesley College and became the first woman president of the American Psychological Association.

Wellesley College Archives



Margaret Floy Washburn (1871–1939) After becoming the first American woman to earn an official Ph.D. in psychology, Washburn went on to a distinguished career. Despite the discrimination against women that was widespread in higher education during the early twentieth century, Washburn made many contributions to psychology. She was the second woman to be elected president of the American Psychological Association.

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Francis C. Sumner (1895–1954) Francis Sumner studied under G. Stanley Hall at Clark University. In 1920, he became the first African American to earn a Ph.D. in psychology. Sumner later joined Howard University in Washington, D.C., and helped create a strong psychology program that led the country in training African American psychologists (Belgrave & Allison, 2010; Guthrie, 2000, 2004).

Courtesy of the Moorland-Spingarn Research Center, Howard University Archives

Sigmund Freud

Psychoanalysis

Wundt, James, and other early psychologists emphasized the study of conscious experiences. But at the turn of the twentieth century, new approaches challenged the principles of both structuralism and functionalism.

In Vienna, Austria, a physician named **Sigmund Freud** was developing an intriguing theory of personality based on uncovering causes of behavior that were *unconscious*, or hidden from the person's conscious awareness. Freud's school of thought, called **psychoanalysis**, emphasized the role of unconscious conflicts in determining behavior and personality.

Freud's psychoanalytic theory of personality and behavior was based largely on his work with his patients and on insights derived from self-analysis. Freud believed that human behavior was motivated by unconscious conflicts that were almost always sexual or aggressive in nature. Past experiences, especially childhood experiences, were thought to be critical in the formation of adult personality and behavior. According to Freud (1904), glimpses of these unconscious impulses are revealed in everyday life in dreams, memory blocks, slips of the tongue, and spontaneous humor. Freud believed that when unconscious conflicts became extreme, psychological disorders could result.

Freud's psychoanalytic theory of personality also provided the basis for a distinct form of psychotherapy. Many of the fundamental ideas of psychoanalysis continue to influence psychologists and other professionals in the mental health field. We'll explore Freud's theory in more depth in Chapter 11, on personality, and Chapter 15, on psychotherapy.

Sigmund Freud (1856–1939) In 1909, Freud (*front left*) and several other psychoanalysts were invited by G. Stanley Hall (*front center*) to participate in Clark University's 20th anniversary celebration in Worcester, Massachusetts (Hogan, 2003). Freud delivered five lectures on psychoanalysis. Listening in the audience was William James, who later wrote to a friend that Freud struck him as "a man obsessed with fixed ideas" (Rosenzweig, 1997). Carl Jung (*front right*), who later developed his own theory of personality, also attended this historic conference.



Clark University

behaviorism School of psychology and theoretical viewpoint that emphasizes the study of observable behaviors, especially as they pertain to the process of learning.

humanistic psychology School of psychology and theoretical viewpoint that emphasizes each person's unique potential for psychological growth and self-direction.

John B. Watson

Behaviorism

The course of psychology changed dramatically in the early 1900s when another approach, called **behaviorism,** emerged as a dominating force. Behaviorism rejected the emphasis on consciousness promoted by structuralism and functionalism. It also flatly rejected Freudian notions about unconscious influences. Instead, behaviorism contended that psychology should focus its scientific investigations strictly on *overt behavior*—observable behaviors that could be objectively measured and verified.

Behaviorism is yet another example of the influence of physiology on psychology. Behaviorism grew out of the pioneering work of a Russian physiologist named **Ivan Pavlov.** Pavlov demonstrated that dogs could learn to associate a neutral stimulus, such as the sound of a bell, with an automatic behavior, such as reflexively salivating to food. Once an association between the sound of the bell and the food was formed, the sound of the bell alone would trigger the salivation reflex in the dog. Pavlov enthusiastically believed he had discovered the mechanism by which all behaviors were learned.

In the United States, a young, dynamic psychologist named **John B. Watson** shared Pavlov's enthusiasm. Watson (1913) championed behaviorism as a new school of psychology. Structuralism was still an influential perspective, but Watson strongly objected to both its method of introspection and its focus on conscious mental processes. As Watson (1924) wrote in his classic book, *Behaviorism:*

> Behaviorism, on the contrary, holds that the subject matter of human psychology *is the behavior of the human being.* Behaviorism claims that consciousness is neither a definite nor a usable concept. The behaviorist, who has been trained always as an experimentalist, holds, further, that belief in the existence of consciousness goes back to the ancient days of superstition and magic.

The influence of behaviorism on American psychology was enormous. The goal of the behaviorists was to discover the fundamental principles of *learning*—how behavior is acquired and modified in response to environmental influences. For the most part, the behaviorists studied animal behavior under carefully controlled laboratory conditions.

Although Watson left academic psychology in the early 1920s, behaviorism was later championed by an equally forceful proponent—the famous American psychologist **B. F. Skinner.** Like Watson, Skinner believed that psychology should restrict itself to studying outwardly observable behaviors that could be measured and verified. In compelling experimental demonstrations, Skinner systematically used reinforcement or punishment to shape the behavior of rats and pigeons.

Between Watson and Skinner, behaviorism dominated American psychology for almost half a century. During that time, the study of conscious experiences was largely ignored as a topic in psychology (Baars, 2005). In Chapter 5, on learning, we'll look at the lives and contributions of Pavlov, Watson, and Skinner in greater detail.

Three Key Scientists in the Development of Behaviorism
Building on the pioneering research of Russian physiologist Ivan Pavlov, American psychologist John B. Watson founded the school of behaviorism. Behaviorism advocated that psychology should study observable behaviors, not mental processes. Following Watson, B. F. Skinner continued to champion the ideas of behaviorism. Skinner became one of the most influential psychologists of the twentieth century. Like Watson, he strongly advocated the study of observable behaviors rather than mental processes.


Culver Pictures
Ivan Pavlov (1849–1936)


Underwood & Underwood/Corbis
John B. Watson (1878–1958)

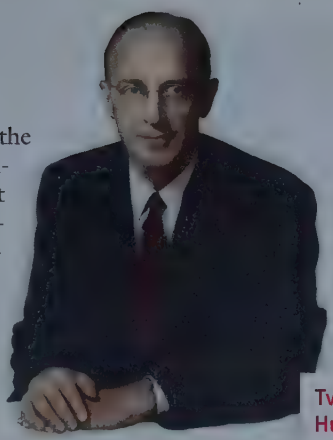

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B. F. Skinner (1904–1990)

Carl Rogers

Humanistic Psychology

For several decades, behaviorism and psychoanalysis were the perspectives that most influenced the thinking of American psychologists. In the 1950s, a new school of thought emerged, called **humanistic psychology.** Because humanistic psychology was distinctly different from both psychoanalysis and behaviorism, it was sometimes referred to as the "third force" in American psychology (Watson & others, 2011).

Humanistic psychology was largely founded by American psychologist **Carl Rogers** (Elliott & Farber, 2010). Like Freud, Rogers was influenced by his experiences with his psychotherapy clients. However, rather than emphasizing unconscious conflicts, Rogers emphasized the *conscious* experiences of his patients, including each person's unique potential for psychological growth and self-direction. In contrast to the behaviorists, who saw human behavior as being shaped and maintained by external causes, Rogers emphasized self-determination, free will, and the importance of choice in human behavior (Elliott & Farber, 2010; Kirschenbaum & Jourdan, 2005).



Carl Rogers (1902–1987)



Special Collections, Donald C. Davidson Library/ University of California, Santa Barbara

Courtesy of Robert D. Farber University Archives at Brandeis University

Abraham Maslow (1908–1970)

Two Leaders in the Development of Humanistic Psychology Carl Rogers and Abraham Maslow were key figures in establishing humanistic psychology. Humanistic psychology emphasized the importance of self-determination, free will, and human potential. The ideas of Carl Rogers have been particularly influential in modern psychotherapy. Abraham Maslow's theory of motivation emphasized the importance of psychological growth.

Abraham Maslow was another advocate of humanistic psychology. Maslow developed a theory of motivation that emphasized psychological growth, which we'll discuss in Chapter 8. Like psychoanalysis, humanistic psychology included not only influential theories of personality but also a form of psychotherapy, which we'll discuss in later chapters.

By briefly stepping backward in time, you've seen how the debates among the key thinkers in psychology's history shaped the development of psychology as a whole. Each of the schools that we've described had an impact on the topics and methods of psychological research. As you'll see throughout this textbook, that impact has been a lasting one.

From the founding of Wundt's laboratory in 1879, psychology has evolved to its current status as a dynamic and multidimensional science. In the next section, we'll touch on some of the more recent developments in psychology's evolution. We'll also explore the diversity that characterizes contemporary psychology.

CONCEPT REVIEW 1.1

Major Schools in Psychology

Identify the school or approach and the founder associated with each of the following statements.

1. Psychology should study how behavior and mental processes allow organisms to adapt to their environments.
   School/Approach _____
   Founder _____
2. Psychology should emphasize each person's unique potential for psychological growth and self-directedness.
   School/Approach _____
   Founder _____
3. Psychology should focus on the elements of conscious experiences, using the method of introspection.
   School/Approach _____
   Founder _____
4. Human behavior is strongly influenced by unconscious sexual and aggressive conflicts.
   School/Approach _____
   Founder _____
5. Psychology should scientifically investigate observable behaviors that can be measured objectively and should not study consciousness or mental processes.
   School/Approach _____
   Founder _____

*Note: Concept review answers can be found on the last page of the chapter.

Contemporary Psychology

KEY THEME

› As psychology has developed as a scientific discipline, the topics it investigates have become progressively more diverse.

KEY QUESTIONS

› How do the perspectives in contemporary psychology differ in emphasis and approach?

› What are psychology's major specialty areas?

Over the past half-century, the range of topics in psychology has become progressively more diverse. And, as psychology's knowledge base has increased, psychology itself has become more specialized. Rather than being dominated by a particular approach or school of thought, today's psychologists tend to identify themselves according to (1) the *perspective* they emphasize in investigating psychological topics and (2) the *specialty area* in which they have been trained and practice.

Major Perspectives in Psychology

Any given topic in contemporary psychology can be approached from a variety of perspectives. Each perspective discussed here represents a different emphasis or point of view that can be taken in studying a particular behavior, topic, or issue. As you'll see in this section, the influence of the early schools of psychology is apparent in the first four perspectives that characterize contemporary psychology.

The Biological Perspective

As we've already noted, physiology has played an important role in psychology since it was founded. Today, that influence continues, as is shown by the many psychologists who take the biological perspective. The *biological perspective* emphasizes studying the physical bases of human and animal behavior, including the nervous system, endocrine system, immune system, and genetics. More specifically, **neuroscience** refers to the study of the nervous system, especially the brain.

Advances in medicine and technology have reinforced interest in the biological perspective. The discovery of drugs that helped control the symptoms of severe psychological disorders sparked questions about the interaction among biological factors and human behavior, emotions, and thought processes.

Equally important have been technological advances that have allowed psychologists and other researchers to explore the human brain as never before. The development of the PET scan, MRI scan, functional MRI (fMRI) scan, and other techniques has allowed scientists to study the structure and activity of the intact brain. Later in the chapter, we'll describe these brain-imaging techniques and how psychologists use them as research tools.



Dr. Lu Fan courtesy Dr. Karyn Frick

The Biological Perspective The physiological aspects of behavior and mental processes are studied by biological psychologists. Psychologists and other scientists who specialize in the study of the brain and the rest of the nervous system are often called *neuroscientists*. Shown above is neuroscientist Karyn Frick, discussing an experimental design with psychology graduate student Patrick Orr. Frick and her colleagues are studying how aging and sex hormones, especially estrogen and progesterone, alter memory.

The Psychodynamic Perspective

The key ideas and themes of Freud's landmark theory of psychoanalysis continue to be important among many psychologists, especially those working in the mental health field. As you'll see in Chapter 11, on personality, and Chapter 15, on therapies, many of Freud's ideas have been expanded or modified by his followers. Today, psychologists who take the *psychodynamic perspective* may or may not follow Freud or take a psychoanalytic approach. However, they do tend to emphasize the importance of unconscious influences, early life experiences, and interpersonal relationships in explaining the underlying dynamics of behavior or in treating people with psychological problems.

The Behavioral Perspective

Watson and Skinner's contention that psychology should focus on observable behaviors and the fundamental laws of learning is evident today in the *behavioral perspective*. Contemporary psychologists who take the behavioral perspective continue to study how behavior is acquired or modified by environmental causes. Many psychologists who work in the area of mental health also emphasize the behavioral perspective in explaining and treating psychological disorders. In Chapter 5, on learning, and Chapter 15, on therapies, we'll discuss different applications of the behavioral perspective.

The Humanistic Perspective

The influence of the work of Carl Rogers and Abraham Maslow continues to be seen among contemporary psychologists who take the humanistic perspective. The *humanistic perspective* focuses on the motivation of people to grow psychologically, the influence of interpersonal relationships on a person's self-concept, and the importance of choice and self-direction in striving to reach one's potential. Like the psychodynamic perspective, the humanistic perspective is often emphasized among psychologists working in the mental health field. You'll encounter the humanistic perspective in the chapters on motivation (8), personality (11), and therapies (15).

The Positive Psychology Perspective

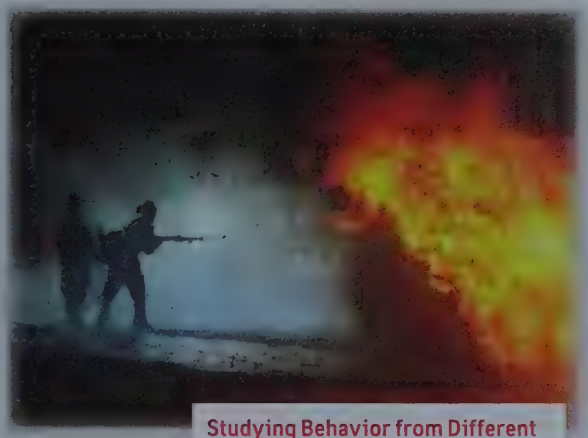
The humanistic perspective's emphasis on psychological growth and human potential contributed to the recent emergence of a new perspective. **Positive psychology** is a field of psychological research and theory focusing on the study of positive emotions and psychological states, positive individual traits, and the social institutions that foster those qualities in individuals and communities (Peterson, 2006; Seligman & Csikszentmihalyi, 2000; Seligman & others, 2005). By studying the conditions and processes that contribute to the optimal functioning of people, groups, and institutions, positive psychology seeks to counterbalance psychology's traditional emphasis on psychological problems and disorders (Gable & Haidt, 2005; Seligman & others, 2006).

Topics that fall under the umbrella of positive psychology include personal happiness, optimism, creativity, resilience, character strengths, and wisdom. Positive psychology is also focused on developing therapeutic techniques that increase personal well-being rather than just alleviating the troubling symptoms of psychological disorders (Snyder & others, 2011). Insights from positive psychology research will be evident in many chapters, including the chapters on motivation and emotion (8); lifespan development (9); personality (11); stress, health, and coping (13); and therapies (15).

The Cognitive Perspective

During the 1960s, psychology experienced a return to the study of how mental processes influence behavior. Often referred to as "the cognitive revolution" in psychology, this movement represented a break from traditional behaviorism. Cognitive psychology focused once again on the important role of mental processes in how people process and remember information, develop language, solve problems, and think.

The development of the first computers in the 1950s contributed to the cognitive revolution. Computers gave psychologists a new model for conceptualizing human mental processes—human thinking, memory, and perception could be understood in terms of an information-processing model. We'll consider the cognitive perspective in several chapters, including Chapter 7, on thinking, language, and intelligence.



REUTERS/Gene Blevins

Studying Behavior from Different Psychological Perspectives

Psychologists can study a particular behavior, topic, or issue from different perspectives. Consider the heroic efforts of volunteer firefighters. These men and women may spend days and weeks on the fire line, working against an overwhelming force as well as their own exhaustion.

Taking the *biological perspective*, a psychologist might study whether there are biological differences between volunteer firefighters and other people, such as the ability to stay calm and focused in the face of dangerous situations. A psychologist taking the *behavioral perspective* might look at how helping behaviors are learned and reinforced. And a psychologist who took the *positive psychology* perspective might study the motives that underlie the volunteers's willingness to risk their lives in order to help others in their community.

- **neuroscience** The study of the nervous system, especially the brain.
- **positive psychology** The study of positive emotions and psychological states, positive individual traits, and the social institutions that foster positive individuals and communities.

Influence of Culture on Behavior: Social Loafing Versus Social Striving Cross-cultural psychology highlights the fact that common behaviors are not always universal. On Micronesia's Ifalik Island, these islanders are working together to set a large fishing net. In highly collectivistic cultures like Micronesia, people tend to work harder in a group than when alone. This behavior, called *social striving*, contrasts with *social loafing*, which refers to expending less effort as the size of the group increases (Latane & others, 2006). Although once thought to be universal, social loafing is more common in individualistic cultures (Klehe & Anderson, 2007).



Wolfgang Kaehler/Corbis

The Cross-Cultural Perspective

More recently, psychologists have taken a closer look at how cultural factors influence patterns of behavior—the essence of the *cross-cultural perspective.* By the late 1980s, *cross-cultural psychology* had emerged in full force as large numbers of psychologists began studying the diversity of human behavior in different cultural settings and countries (Kitayama & Uskul, 2011; Smith, 2010). In the process, psychologists discovered that some well-established psychological findings were not as universal as they had thought.

For example, one well-established psychological finding was that people exert more effort on a task when working alone than when working as part of a group, a phenomenon called *social loafing.* First demonstrated in the 1970s, social loafing was a consistent finding in several psychological studies conducted with American and European subjects. But when similar studies were conducted with Chinese participants, the opposite was found to be true (Hong & others, 2008). Chinese participants worked harder on a task when they were part of a group than when they were working alone.

Today, psychologists are keenly attuned to the influence of cultural factors on behavior (Heine, 2010; Henrich & others, 2010a, b). Although many psychological processes *are* shared by all humans, it's important to keep in mind that there are cultural variations in behavior. Thus, we have included Culture and Human Behavior boxes throughout this textbook to help sensitize you to the influence of culture on behavior—including your own. We describe cross-cultural psychology in more detail in the Culture and Human Behavior box the next page.

evolutionary psychology The application of principles of evolution, including natural selection, to explain psychological processes and phenomena.

culture The attitudes, values, beliefs, and behaviors shared by a group of people and communicated from one generation to another.

cross-cultural psychology Branch of psychology that studies the effects of culture on behavior and mental processes.

ethnocentrism The belief that one's own culture or ethnic group is superior to all others and the related tendency to use one's own culture as a standard by which to judge other cultures.

individualistic cultures Cultures that emphasize the needs and goals of the individual over the needs and goals of the group.

collectivistic cultures Cultures that emphasize the needs and goals of the group over the needs and goals of the individual.

The Evolutionary Perspective

Evolutionary psychology refers to the application of the principles of evolution to explain psychological processes and phenomena (Buss, 2009). The *evolutionary perspective* has grown out of a renewed interest in the work of English naturalist Charles Darwin. As noted previously, Darwin's (1859) first book on evolution, *On the Origin of Species,* played an influential role in the thinking of many early psychologists.

The theory of evolution proposes that the individual members of a species compete for survival. Because of inherited differences, some members of a species are better adapted to their environment than are others. Organisms that inherit characteristics that increase their chances of survival in their particular habitat are more likely to survive, reproduce, and pass on their characteristics to their offspring. Conversely, individuals that inherit less useful characteristics are less likely to survive, reproduce, and pass on their characteristics. This process reflects the principle of *natural selection:* The most adaptive characteristics are "selected" and perpetuated in the next generation.

The Evolutionary Perspective The evolutionary perspective analyzes behavior in terms of how it increases a species' chances to survive and reproduce. Comparing behaviors across species can often lead to new insights about the adaptive function of a particular behavior. For example, close bonds with caregivers are essential to the primate infant's survival—whether that infant is a golden monkey at a wildlife preserve in northern China or a human infant at a family picnic in Norway. As you'll see in later chapters, the evolutionary perspective has been applied to many different areas of psychology, including human relationships, eating behaviors, and emotional responses (Confer & others, 2010; Scott-Phillips & others, 2011).



Corbis/Keren Su



Steve Prezant/Corbis

CULTURE AND HUMAN BEHAVIOR

What Is Cross-Cultural Psychology?

All cultures are simultaneously very similar and very different.
HARRY TRIANDIS (2005)

People around the globe share many attributes: We all eat, sleep, form families, seek happiness, and mourn losses. Yet the way in which we express our human qualities can vary considerably among cultures. *What* we eat, *where* we sleep, and *how* we form families, define happiness, and express sadness can differ greatly in different cultures (G. Smith & others, 2006).

Culture is a broad term that refers to the attitudes, values, beliefs, and behaviors shared by a group of people and communicated from one generation to another (Cohen, 2009, 2010). When this broad definition is applied to people throughout the world, about 4,000 different cultures can be said to exist. Studying the differences among those cultures and the influences of culture on behavior are the fundamental goals of **cross-cultural psychology** (Smith, 2010).

A person's sense of cultural identity is influenced by such factors as ethnic background, nationality, race, religion, and language. As we grow up within a given culture, we learn our culture's *norms*, or unwritten rules of behavior. Once those cultural norms are understood and internalized, we tend to act in accordance with them without too much thought. For example, according to the dominant cultural norms in the United States, infants and toddlers are not supposed to routinely sleep in the same bed as their parents. In many other cultures around the world, however, it's taken for granted that babies *will* sleep in the same bed as their parents or other adult relatives (Mindell & others, 2010a, b). Members of these other cultures are often surprised and even shocked at the U.S. practice of separating infants and toddlers from their parents at night. (In the Culture and Human Behavior box in Chapter 9, we discuss this topic at greater length.)

Whether considering sleeping habits or hairstyles, most people share a natural tendency to accept their *own* cultural rules as defining what's "normal." This tendency to use your own culture as the standard for judging other cultures is called **ethnocentrism.** Although it may be a natural tendency, ethnocentrism can lead to the inability to separate ourselves from our own cultural backgrounds and biases so that we can understand the behaviors of others (Bizumic & others, 2009). Ethnocentrism may also prevent us from being aware of how our behavior has been shaped by our own culture.

Some degree of ethnocentrism is probably inevitable, but extreme ethnocentrism can lead to intolerance for other cultures. If we believe that our way of seeing things or behaving is the only proper one, other ways of behaving and thinking may seem not only foreign, but ridiculous, inferior, wrong, or immoral.

In addition to influencing how we behave, culture affects how we define our sense of self (Markus & Kitayama, 1991, 1998, 2010). For the most part, the dominant cultures of the United States, Canada, Australia, New Zealand, and Europe can be described as individualistic cultures. **Individualistic cultures** emphasize the needs and goals of the individual over the needs and goals of the group (Markus & Kitayama, 2010). In individualistic societies, social behavior is more strongly influenced by individual preferences and attitudes than by cultural norms and values. In such cultures, the self is seen as *independent*, autonomous, and distinctive. Personal identity is defined by individual achievements, abilities, and accomplishments.

In contrast, **collectivistic cultures** emphasize the needs and goals of the group over the needs and goals of the individual. Social behavior is more heavily influenced by cultural norms than by individual preferences and attitudes. In a collectivistic culture, the self is seen as being much more *interdependent* with others. Relationships with others and identification with a larger group, such as the family or tribe, are key components of personal identity. The cultures of Asia, Africa, and Central and South America tend to be collectivistic. According to cross-cultural psychologist Harry Triandis (2005), about two-thirds of the world's population live in collectivistic cultures.

The distinction between individualistic and collectivistic societies is useful in cross-cultural psychology. Nevertheless, psychologists are careful not to assume that these generalizations are true of *every* member or *every* aspect of a given culture (Kitayama & Uskul, 2011). Most cultures are neither completely individualistic nor completely collectivistic, but fall somewhere between the two extremes. Equally important, psychologists recognize that there is a great deal of individual variation among the members of every culture (Heine & Norenzayan, 2006). It's important to keep that qualification in mind when cross-cultural findings are discussed, as they will be throughout this book.

The Culture and Human Behavior boxes that we have included in this book will help you learn about human behavior in other cultures. They will also help you understand how culture affects *your* behavior, beliefs, attitudes, and values as well. We hope you will find this feature both interesting and enlightening!



KIM KYUNG-HOON/Reuters/Corbis

Cultural Differences in Subway Norms In Japan, subway commuters line up politely behind white lines on the platform and patiently wait their turn to board the train. White-gloved conductors obligingly "assist" passengers in boarding by shoving them in from behind, cramming as many people into the subway car as possible. Clearly, the norms that govern subway-riding behavior are very different in American and Japanese cultures.

Psychologists who take the evolutionary perspective assume that psychological processes are also subject to the principle of natural selection. As David Buss (2008) writes, "An evolved psychological mechanism exists in the form that it does because it solved a specific problem of survival or reproduction recurrently over evolutionary history." That is, those psychological processes that helped individuals adapt to their environments also helped them survive, reproduce, and pass those abilities on to their offspring.

As you consider the possible role of evolutionary adaptations in shaping modern psychological processes, keep the time frame of evolutionary changes in perspective. If evolutionary influences helped shape psychological processes, those influences occurred over hundreds of thousands of years. What we think of as human civilization has existed for only about 10,000 years, since the earliest appearance of agriculture. In contrast, our ancient human ancestors spent more than *2 million years* as primitive hunter-gatherers.

The important point here is that a few thousand years are not long enough for sweeping evolutionary changes to take place. Psychological processes that were adaptations to a prehistoric way of life may continue to exist in the human behavioral repertoire today. However, as you'll see in later chapters, some of those processes may not necessarily be adaptive in our modern world (Loewenstein, 2010; Tooby & others, 2008).

Specialty Areas in Psychology

The enormous diversity of contemporary psychology as a scientific discipline is reflected in the following thumbnail descriptions of psychology's specialty areas. Figure 1.1 shows the percentage of recent doctoral students who specialized in these areas and, on the right, the primary employment settings of psychologists.

Biological psychology studies the relationship between psychological processes and the body's physical systems, including the brain and the rest of the nervous system, the endocrine system, the immune system, and genetics. *Neuroscience* is included in this category.

Clinical psychology studies the causes, diagnosis, treatment, and prevention of different types of behavioral and emotional disorders, such as anxiety, mood, or eating disorders. Clinical psychologists have extensive training in evaluating and diagnosing psychological disorders, psychotherapy techniques, and psychological testing.

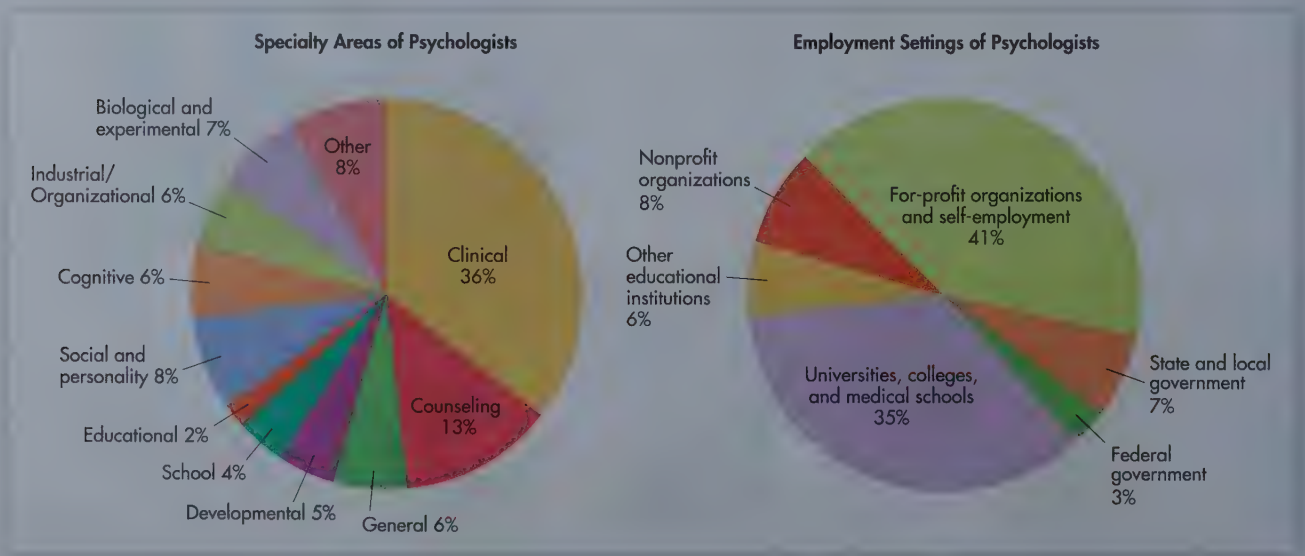


FIGURE 1.1 Specialty Areas and Employment Settings The left pie chart shows the specialty areas of individuals who recently received their doctorates in psychology. The category "Other" includes such specialty areas as health psychology, forensic psychology, and sports psychology. The right pie chart shows psychologists' primary places of employment.

Source: Finno & others (2006); NSF/NIH/USED/USDA/NEH/NASA, 2009 Survey of Earned Doctorates.

Cognitive psychology investigates mental processes, including reasoning and thinking, problem solving, memory, perception, mental imagery, and language.

Counseling psychology helps people of all ages adjust, adapt, and cope with personal and interpersonal problems in such diverse areas as relationships, work, education, marriage, child rearing, and aging.

Educational psychology studies how people of all ages learn. Educational psychologists help develop the instructional methods and materials used to train people in both educational and work settings.

Experimental psychology is the term traditionally used to describe research focused on such basic topics as sensory and perceptual processes, and principles of learning, emotion, and motivation. However, note that experiments can be conducted by psychologists in every area of psychology.

Developmental psychology studies the physical, social, and psychological changes that occur at different ages and stages of the lifespan, from conception to old age.

Forensic psychology applies psychological principles and techniques to legal issues, such as assessment and treatment of offenders, mental competency to stand trial, child custody, jury selection, and eyewitness testimony.

Health psychology focuses on the role of psychological factors in the development, prevention, and treatment of illness. Health psychology includes such areas as stress and coping, the relationship between psychological factors and physical health, and ways of promoting health-enhancing behaviors.

Industrial/organizational psychology is concerned with the relationship between people and work. This specialty includes such topics as job analysis, personnel selection and training, worker productivity, job satisfaction, leadership, and group behavior within organizations.

Personality psychology studies the nature of human personality, including individual differences, the characteristics that make each person unique, and how those characteristics originated and developed.

Rehabilitation psychology applies psychological knowledge to helping people with chronic and disabling health conditions, such as accident or stroke victims, adapt to their situation and attain optimal psychological, interpersonal, and physical functioning.

Social psychology explores how people are affected by their social environments, including how people think about and influence others. Topics as varied as conformity, obedience, persuasion, interpersonal attraction, helping behavior, prejudice, aggression, and social beliefs are studied by social psychologists.

Sports psychology uses psychological theory and knowledge to enhance athletic motivation, performance, and consistency.

Many students wonder how clinical psychologists differ from psychiatrists. Both clinical psychologists and psychiatrists are trained in the diagnosis, treatment, causes, and prevention of psychological disorders. However, their training and credentials are different. The training that a *clinical psychologist* receives leads to a doctorate in clinical psychology, either a Ph.D. or Psy.D. Clinical psychologists have extensive training in the different types of psychotherapy, which are described in Chapter 15.



Phil Soneili/soneili.eu

Military Psychologists: Serving Those Who Serve Shown on duty in Iraq, Army psychologist Captain Jeffrey Bass (left) regularly travels into combat zones with his regiment and supervises a mental health clinic (Munsey, 2008, 2007a). Bass combines on-site counseling with efforts to screen soldiers for the effects of combat stress. There is an increased demand for psychologists in all branches of the military, both in war zones and stateside. At home, military psychologists help returning soldiers and their families deal with the aftereffects of combat stress, readjusting to civilian life, and coping with injuries, especially traumatic brain injuries (Munsey, 2009). Military psychologists also help select and train army personnel for particular roles or assignments, including special operations.

School Psychology There are about 25,000 school psychologists in the United States who provide a variety of psychological services to students and families. Some of the activities that school psychologists perform include counseling and assessing students, consulting with parents and school staff, and working with outside agencies to promote learning and development.



VoisinPhoto Researchers

psychiatry Medical specialty area focused on the diagnosis, treatment, causes, and prevention of mental and behavioral disorders.

In contrast, **psychiatry** is a medical specialty. Thus, a *psychiatrist* first obtains a medical degree, either an M.D. or D.O., followed by several years of specialized training in the treatment of mental disorders. Psychiatrists are more likely to emphasize the role of biological factors in psychological disorders. As physicians, psychiatrists can hospitalize people and order biomedical therapies, such as *electroconvulsive therapy* (ECT) or *transcranial magnetic stimulation* (TMS). Psychiatrists can also prescribe medications to treat the symptoms of different psychological disorders. These biomedical therapies are described in Chapter 15.

Clinical psychologists are not medical doctors and cannot order medical treatments. In most of the United States, clinical psychologists cannot prescribe medications. However, legislation enacted in New Mexico, Louisiana, and the U.S. Territory of Guam allows clinical psychologists to prescribe medications after completing additional coursework and supervised clinical training (McGrath, 2010). Especially in rural areas with few mental health professionals, allowing trained psychologists to prescribe medications can help many people who are otherwise unable to gain access to mental health care.

Despite the diversity of their work settings and interests, psychologists share common methods of investigating human behavior and mental processes. In the next section, we'll look at how psychologists are guided by the *scientific method* in their efforts to understand behavior and mental processes.

CONCEPT REVIEW 1.2

Identifying Perspectives and Specialties

For each of the following psychologists, fill in the blanks, identifying the perspective and specialty area.

1. I study brain development in infants.

   _____ _____
   Perspective Specialty

2. I compare problem-solving strategies in the United States and China.

   _____ _____
   Perspective Specialty

3. I develop programs to help people modify unhealthy eating habits, focusing on the environmental cues that trigger overeating.

   _____ _____
   Perspective Specialty

4. I investigate the early life experiences of people who seek psychotherapy for symptoms of depression.

   _____ _____
   Perspective Specialty

5. I compare mate selection patterns in primitive and modern societies.

   _____ _____
   Perspective Specialty

6. I am currently studying the role that forgiveness plays in family relationships. I want to examine the extent to which forgiveness fosters the development of a healthy family environment and positive individual traits.

   _____ _____
   Perspective Specialty



The Scientific Method

KEY THEME

› The scientific method is a set of assumptions, attitudes, and procedures that guides all scientists, including psychologists, in conducting research.

KEY QUESTIONS

› What assumptions and attitudes are held by psychologists?

› What characterizes each step of the scientific method?

› How does a hypothesis differ from a theory?

The four basic goals of psychology are to (1) describe, (2) explain, (3) predict, and (4) control or influence behavior and mental processes. To illustrate how these goals guide psychological research, consider the example of stress. Most people—especially college students—have an intuitive sense of what the word "stress" means. Psychologists, however, seek to go beyond intuitive or "common sense" understandings of human experience.

Here's how psychology's goals might help guide their research:

1. *Describe:* Trying to objectively *describe* the experience and effects of stress, Dr. Garcia studies the sequence of responses that occur during stressful experiences, looking for patterns in thoughts, emotions, and behaviors.
2. *Explain:* Seeking to *explain* the nature of stressful experiences, Dr. Lazarus studies how thoughts about stressful events evoke unpleasant emotions and physical changes.
3. *Predict:* Dr. Kiecolt investigates responses to different kinds of challenging events, hoping to be able to *predict* the kinds of events that are most likely to evoke a stress response.
4. *Control or Influence:* After studying the effectiveness of different coping strategies, Dr. Folkman helps people use those coping strategies to better *control* their reactions to stressful events.

To achieve their goals, psychologists rely on the scientific method. The **scientific method** refers to a set of assumptions, attitudes, and procedures that guide researchers in creating questions to investigate, in generating evidence, and in drawing conclusions.

Like all scientists, psychologists are guided by the basic scientific assumption that *events are lawful.* When this scientific assumption is applied to psychology, it means that psychologists assume that behavior and mental processes follow consistent patterns. Psychologists are also guided by the assumption that *events are explainable.* Thus, psychologists assume that behavior and mental processes have a cause or causes that can be understood through careful, systematic study.

In striving to identify and understand consistent patterns of behavior, psychologists are *open-minded.* They are willing to consider new or alternative explanations of behavior and mental processes. However, their open-minded attitude is tempered by a *healthy sense of scientific skepticism.* That is, psychologists critically evaluate the evidence for new findings, especially those that seem contrary to established knowledge. And, in announcing new ideas and findings, psychologists are *cautious* in the claims they make, not wishing to overstate or exaggerate the findings.

Collectively, the assumptions and attitudes that psychologists assume reflect critical thinking. One goal of our textbook is to help you become a better critical thinker, which we discuss on the next page.

scientific method A set of assumptions, attitudes, and procedures that guide researchers in creating questions to investigate, in generating evidence, and in drawing conclusions.

empirical evidence Verifiable evidence that is based upon objective observation, measurement, and/or experimentation.

hypothesis (high-POTH-eh-sis) A tentative statement about the relationship between two or more variables; a testable prediction or question.

The Steps in the Scientific Method

Systematically Seeking Answers

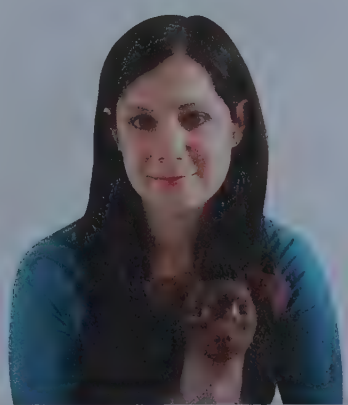
Like any science, psychology is based on verifiable or **empirical evidence**—evidence that is the result of objective observation, measurement, and experimentation. As part of the overall process of producing empirical evidence, psychologists follow the four basic steps of the scientific method. In a nutshell, these steps are:

- Formulate a specific question that can be tested
- Design a study to collect relevant data
- Analyze the data to arrive at conclusions
- Report the results

Following the basic guidelines of the scientific method does not guarantee that valid conclusions will always be reached. However, these steps help guard against bias and minimize the chances for error and faulty conclusions. Let's look at some of the key concepts associated with each step of the scientific method.

Step 1. Formulate a Testable Hypothesis

Once a researcher has identified a question or an issue to investigate, he or she must formulate a hypothesis that can be tested empirically. Formally, a **hypothesis** is a tentative statement that describes the relationship between two or more variables. A hypothesis is often stated as a specific prediction that can be empirically tested, such as "psychological stress increases the likelihood of physical illness."



Formulating a Hypothesis: Do Dogs Look Like Their Owners? Hypotheses are often generated from everyday observations. For example, many people believe that pets resemble their owners. How could this hypothesis be scientifically tested? Psychologists Michael Roy and Nicholas Christenfeld (2004, 2005) found that study participants were able to accurately match photos of dogs with photos of their owners—but only if the dogs were purebred. The explanation? People tend to choose dogs that resemble themselves.

Alissa Rosenhaft

CRITICAL THINKING

What Is Critical Thinking?

As you'll see throughout this text, many issues in contemporary psychology are far from being settled. And although research findings may have been arrived at in a very objective manner, the interpretation of what findings mean and how they should be applied can be a matter of considerable debate. In short, there is a subjective side to any science. But this is especially important in psychology because psychological research often involves topics and issues that apply directly to people's everyday concerns and behavior.

As you look at the evidence that psychology has to offer on many topics, we want to encourage you to engage in critical thinking. In general, critical thinking refers to *actively questioning* statements rather than blindly accepting them. More precisely, **critical thinking** is the active process of:

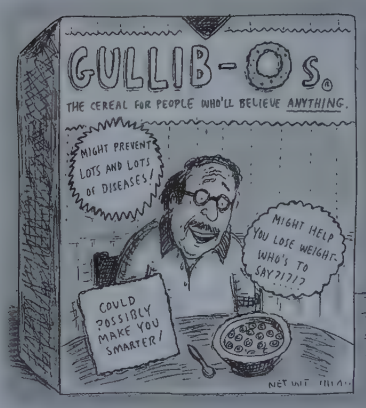
- Minimizing the influence of preconceptions and biases while evaluating evidence.
- Determining the conclusions that can reasonably be drawn from the evidence.
- Considering alternative explanations for research findings or other phenomena.

What are the key attitudes and mental skills that characterize critical thinking?

1. The critical thinker is flexible yet maintains an attitude of healthy skepticism.
Critical thinkers are open to new information, ideas, and claims. They genuinely consider alternative explanations and possibilities. However, this open-mindedness is tempered by a healthy sense of skepticism (J. C. Smith, 2010). The critical thinker consistently asks, "What evidence supports this claim?"

2. The critical thinker scrutinizes the evidence before drawing conclusions.
Critical thinkers strive to weigh all the available evidence *before* arriving at conclusions. And, in evaluating evidence, critical thinkers distinguish between *empirical evidence* versus *opinions* based on feelings or personal experience.

3. The critical thinker can assume other perspectives.
Critical thinkers are not imprisoned by their own points of view. Nor are they limited in their capacity to imagine life experiences and perspectives that are fundamentally different from their own. Rather, the critical thinker strives to understand and evaluate issues from many different angles (Bensley, 2009; Yanchar & others, 2009).



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4. The critical thinker is aware of biases and assumptions.
In evaluating evidence and ideas, critical thinkers strive to identify the biases and assumptions that are inherent in any argument (Riggio & Halpern, 2006). Critical thinkers also try to identify and minimize the influence of their *own* biases.

5. The critical thinker engages in reflective thinking.
Critical thinkers avoid knee-jerk responses. Instead, critical thinkers are *reflective*. Most complex issues are unlikely to have a simple resolution. Therefore, critical thinkers resist the temptation to sidestep complexity by boiling an issue down to an either/or, yes/no kind of proposition. Instead, the critical thinker expects and *accepts* complexity (Halpern, 2007).

As you can see, critical thinking is not a single skill, but rather a set of attitudes and thinking skills (Phan, 2010). As is true with any set of skills, you can get better at these skills with practice. That's one reason we've included Critical Thinking boxes in many chapters of this text.

You'll discover that these Critical Thinking boxes do not follow a rigid formula but are very diverse. Some will challenge your preconceptions about certain topics. Others will invite you to take sides in the debates among some of the most important contributors to modern psychology.

We hope you enjoy this feature!

CRITICAL THINKING QUESTIONS

- Why might other people want to discourage you from thinking critically?
- In what situations is it probably most difficult or challenging for you to exercise critical thinking skills? Why?
- What can you do or say to encourage others to use critical thinking in evaluating questionable claims or assertions?

The **variables** contained in any given hypothesis are simply the factors that can vary, or change. These changes must be capable of being observed, measured, and verified. The psychologist must provide an operational definition of each variable to be investigated. An **operational definition** defines the variable in very specific terms as to how it will be measured, manipulated, or changed.

Operational definitions are important because many of the concepts that psychologists investigate—such as memory, happiness, or stress—can be measured in more than one way. In providing operational definitions of the variables in the study, the researcher spells out in very concrete and precise terms how the variables will be manipulated or measured. In this way, other researchers can understand exactly how the variables were measured or manipulated in a particular study.

■ **critical thinking** The active process of minimizing preconceptions and biases while evaluating evidence, determining the conclusions that can reasonably be drawn from evidence, and considering alternative explanations for research findings or other phenomena.

For example, prior to marrying, some couples attend a premarital education class or workshop designed to help their marriage succeed by exploring such topics as relationship skills, expectations, resolving conflicts, and so on (see Fawcett & others, 2010). You could turn that observation into a testable hypothesis: Premarital education enhances marital quality.

To test that specific prediction, you would need to formulate an operational definition of each variable. How could you operationally define *premarital education*? *Marital quality*? What could you observe and measure that would reflect these factors?

In looking at that hypothesis, Scott Stanley and his colleagues (2006) operationally defined *premarital education* as the couple's response to a question asking if they attended a class, workshop, or counseling session designed to help them prepare for marriage. Answering "no" was scored 0, and "yes" was scored 1. *Marital quality* was operationally defined as the person's 1-to-5 rating in response to several questions about their satisfaction with the marriage. Responding with 1 indicated that the person was *not at all satisfied*, and 5 indicated that the person was *completely satisfied*.

Step 2. Design the Study and Collect the Data

This step involves deciding which research method to use for collecting data. There are two basic categories of *methodology* or research methods—*descriptive* and *experimental*. Each research method answers different kinds of questions and provides different kinds of evidence.

Descriptive methods are research strategies for *observing* and *describing* behavior, including identifying the factors that seem to be associated with a particular phenomenon. Descriptive methods answer the who, what, where, and when kinds of questions about behavior. Who engages in a particular behavior? What factors or events seem to be associated with the behavior? Where does the behavior occur? When does the behavior occur? How often? In the next section, we'll discuss commonly used descriptive methods, including *naturalistic observation, surveys, case studies,* and *correlational studies.*

In contrast, the *experimental method* is used to show that one variable causes change in a second variable. In an experiment, the researcher deliberately varies one factor, then measures the changes produced in a second factor. Ideally, all experimental conditions are kept as constant as possible except for the factor that the researcher systematically varies. Then, if changes occur in the second factor, those changes can be attributed to the variations in the first factor.

Step 3. Analyze the Data and Draw Conclusions

Once observations have been made and measurements have been collected, the raw data need to be analyzed and summarized. Researchers use the methods of a branch of mathematics known as **statistics** to analyze, summarize, and draw conclusions about the data they have collected.

Researchers rely on statistics to determine whether their results support their hypotheses. They also use statistics to determine whether their findings are statistically significant. If a finding is **statistically significant,** it means that the results are not very likely to have occurred by chance. As a rule, statistically significant results confirm the hypothesis. Appendix A provides a more detailed discussion of the use of statistics in psychology research.

Keep in mind that *statistical* significance and *practical* significance are not necessarily the same thing. If a study involves a large number of participants, even small differences among groups of subjects may result in a statistically significant finding. But the actual average differences may be so small as to have little practical significance or importance.

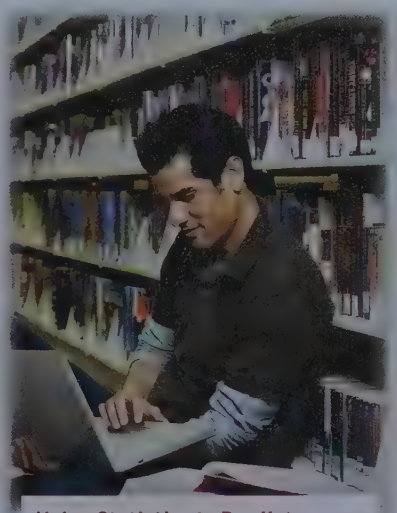
For example, several significant findings emerged in a study looking at factors that would help predict people who are at risk of attempting suicide (Mann & others, 1999). One statistically significant finding was that suicide attempters had fewer years of education (12.7 years) as compared to nonattempters (14 years). In practical terms, however, the difference was not substantial enough to be clinically meaningful in trying to help identify people who pose a suicide risk. So remember that a statistically significant result is simply one that is not very likely to have occurred by chance. Whether the finding is significant in the everyday sense of being important is another matter altogether.

variable A factor that can vary, or change, in ways that can be observed, measured, and verified.

operational definition A precise description of how the variables in a study will be manipulated or measured.

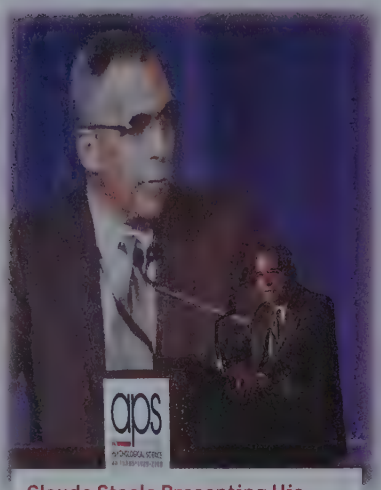
statistics A branch of mathematics used by researchers to organize, summarize, and interpret data.

statistically significant A mathematical indication that research results are not very likely to have occurred by chance.



Mike Kemp/Rubberball/Corbis

Using Statistics to Predict College Success How can you draw conclusions when there are many studies investigating the same basic question? Psychologist Marcus Credé and his colleagues (2010) used a statistical technique called *meta-analysis* to pool the results of almost 100 studies investigating the psychological, social, and study skills most strongly associated with success in college. "Success in college" was operationally defined as college grades and cumulative grade point average (GPA). The meta-analysis revealed that the strongest predictor of college success was a single behavioral factor—class attendance.



Photofusion Picture Library/Alamy

Claude Steele Presenting His Research Along with writing up their research for publication, psychologists also often discuss their research at psychology conferences. Here, Stanford University professor Claude Steele presents his research at the annual meeting of the Association of Psychological Science (APS). Steele's research centers on *stereotype threat*, which refers to the ways that negative stereotypes can affect the performance of people who belong to stigmatized groups. We discuss Steele's influential research in Chapter 7.

A statistical technique called meta-analysis is sometimes used in psychology to analyze the results of many research studies on a specific topic. **Meta-analysis** involves pooling the results of several studies into a single analysis. By creating one large pool of data to be analyzed, meta-analysis can help reveal overall trends that may not be evident in individual studies.

Meta-analysis is especially useful when a particular issue has generated a large number of studies, some of which have produced weak or contradictory results. For example, in a meta-analysis of published and unpublished studies investigating whether premarital education improved marital satisfaction, Elizabeth Fawcett and her colleagues (2010) found that it did *not*.

Step 4. Report the Findings

For advances to be made in any scientific discipline, researchers must publish or share their findings with other scientists. In addition to reporting their results, psychologists provide a detailed description of the study itself, including:

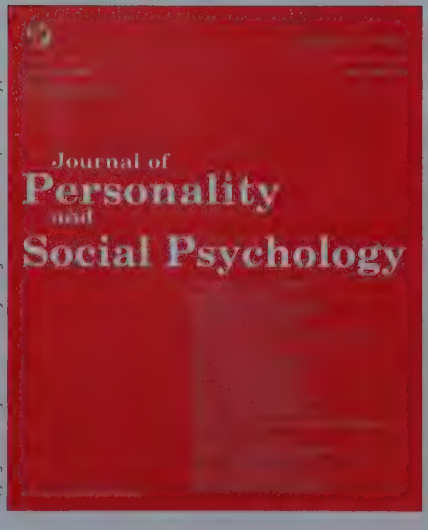
- The rationale for testing the hypothesis
- Who participated in the study
- How participants were selected
- How variables were operationally defined
- What procedures or methods were used
- How the data were analyzed
- What the results seem to suggest

Describing the precise details of the study makes it possible for other investigators to replicate, or repeat, the study. Replication is an important part of the scientific process. When a study is **replicated** and the same basic results are obtained again, scientific *confidence* that the results are accurate is increased. Conversely, if the replication of a study fails to produce the same basic findings, confidence in the original findings is reduced.

One way in which psychologists report their findings is by formally presenting their research at a professional conference. A researcher can also write a paper summarizing the study and submit it to one of the many psychology journals for publication. Before accepting papers for publication, most psychology journals send the paper to other knowledgable psychologists to review. The reviewers critically evaluate different aspects of a study, including how the results were analyzed. If the study conforms to the principles of sound scientific research and contributes to the existing knowledge base, the paper is accepted for publication.

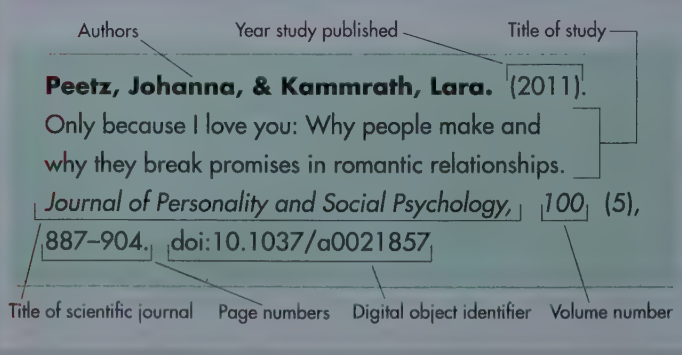
Throughout this text, you'll see citations that look like the following: (Peetz & Kammrath, 2011). These citations identify the sources of the research and ideas that are being discussed. The citation tells you the author or authors (Peetz & Kammrath) of the study and the year (2011) in which the study was published. You can find the complete reference in the alphabetized References section at the back of this text. The complete reference lists the authors' full names, the article title, the journal or book in which the article was published, and the DOI, or digital object identifier. The DOI is a permanent Internet "address" for journal articles and other digital works posted on the Internet.

Figure 1.2 shows you how to decipher the different parts of a typical journal reference.



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FIGURE 1.2 How to Read a Journal Reference Using the References section at the back of this text, you can find the complete source for each citation that appears in a chapter. This figure shows the different components of a typical journal reference. In the chapter itself, the citation for this particular reference would read "(Peetz & Kammrath, 2011)."



Building Theories

Integrating the Findings from Many Studies

As research findings accumulate from individual studies, eventually theories develop. A **theory,** or *model,* is a tentative explanation that tries to account for diverse findings on the same topic. Note that theories are *not* the same as hypotheses. A hypothesis is a specific question or prediction to be tested. In contrast, a theory integrates and summarizes numerous research findings and observations on a particular topic. Along with explaining existing results, a good theory often generates new predictions and hypotheses that can be tested by further research (Higgins, 2004).

As you encounter different theories, try to remember that theories are *tools* for explaining behavior and mental processes, not statements of absolute fact. Like any tool, the value of a theory is determined by its usefulness. A useful theory is one that furthers the understanding of behavior, allows testable predictions to be made, and stimulates new research. Often, more than one theory proves to be useful in explaining a particular area of behavior or mental processes, such as the development of personality or the experience of emotion.

It's also important to remember that theories often reflect the *self-correcting nature of the scientific enterprise.* In other words, when new research findings challenge established ways of thinking about a phenomenon, theories are expanded, modified, and even replaced. Thus, as the knowledge base of psychology evolves and changes, theories evolve and change to produce more accurate and useful explanations of behavior and mental processes.

While the conclusions of psychology rest on empirical evidence gathered using the scientific method, the same is not true of *pseudoscientific* claims (J. C. Smith, 2010). As you'll read in the Science Versus Pseudoscience box on the next page, pseudosciences often claim to be scientific while ignoring the basic rules of science.

meta-analysis A statistical technique that involves combining and analyzing the results of many research studies on a specific topic in order to identify overall trends.

replicate To repeat or duplicate a scientific study in order to increase confidence in the validity of the original findings.

theory A tentative explanation that tries to integrate and account for the relationship of various findings and observations.

descriptive research methods Scientific procedures that involve systematically observing behavior in order to describe the relationship among behaviors and events.

naturalistic observation The systematic observation and recording of behaviors as they occur in their natural setting.

Descriptive Research Methods

KEY THEME

› Descriptive research methods are used to systematically observe and describe behavior.

KEY QUESTIONS

› What are naturalistic observation and case study research, and why and how are they conducted?

› What is a survey, and why is random selection important in survey research?

› What are the advantages and disadvantages of each descriptive method?

Descriptive research methods are strategies for observing and describing behavior. Using descriptive methods, researchers can answer important questions, such as when certain behaviors take place, how often they occur, and whether they are related to other factors, such as a person's age, ethnic group, or educational level. As you'll see in this section, descriptive methods can provide a wealth of information about behavior, especially behaviors that would be difficult or impossible to study experimentally.



Bruce Bennett/Getty Images

Naturalistic Observation: Parents Behaving Badly? After media reports of aggressive behavior by parents and other adult spectators in the stands at Canadian youth hockey games, psychologist Anne Bowker and five observers (2009) systematically recorded the comments of adult spectators at youth hockey games in a large Canadian city. They found that adults made about 100 comments per game, higher than expected. But the researchers also found that almost two-thirds of the comments were directed at the players rather than the officials, and that most comments were positive and encouraging rather than negative or critical. When negative comments were made, they were more often directed at the referees than at the players.

Naturalistic Observation

The Science of People- and Animal-Watching

When psychologists systematically observe and record behaviors as they occur in their natural settings, they are using the descriptive method called **naturalistic observation.** Usually, researchers engaged in naturalistic observation try to avoid being detected by their subjects, whether people or nonhuman animals. The basic goal of naturalistic observation is to detect the behavior patterns that exist naturally—patterns that might not be apparent in a laboratory or if the subjects knew they were being watched.

SCIENCE VERSUS PSEUDOSCIENCE

What Is a Pseudoscience?

The word *pseudo* means "fake" or "false." Thus, a pseudoscience is a fake science. More specifically, a **pseudoscience** is a theory, method, or practice that promotes claims in ways that appear to be scientific and plausible even though supporting empirical evidence is lacking or nonexistent (J. C. Smith, 2010).

Pseudoscientific practices and claims come in all sizes, shapes, and forms. Their unproven claims are often promoted in ways that make them superficially *appear* to be scientifically based (J. C. Smith, 2010). Surveys have found that pseudoscientific beliefs are common among the general public (National Science Board, 2010).

Remember our Prologue story about Brenda, our student who wanted to know whether a magnetic vest or mattress could help her son? We'll use what we learned about magnet therapy to help illustrate some of the common strategies used to promote pseudosciences.

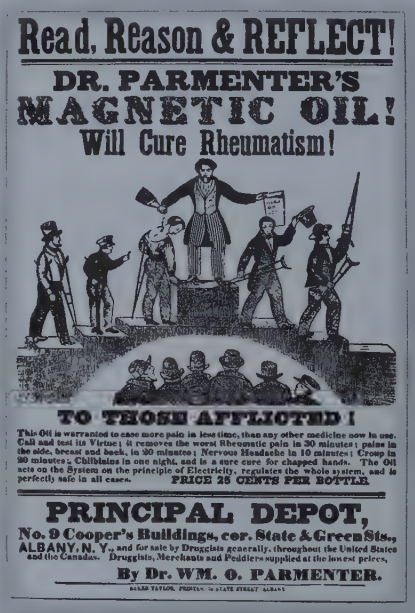
Magnet Therapy: What's the Attraction?

The practice of applying magnets to the body to supposedly treat various conditions and ailments is called *magnet therapy.* Magnet therapy has been around for centuries. It became popular in the United States in the late 1800s with the sale of magnetic brushes, combs, insoles, and clothing.

Today, Americans spend an estimated $500 million each year on magnetic rings, bracelets, belts, wraps, vests, pillows, and mattresses. Worldwide, the sale of magnetic devices is estimated to be $5 billion per year (Winemiller & others, 2005).

The Internet has been a bonanza for those who market products like magnet therapy. Web sites hail the "scientifically proven healing benefits" of magnet therapy for everything from Alzheimer's disease to schizophrenia (e.g., L. Johnston, 2008; D. Parsons, 2007). Treating pain is the most commonly marketed use of magnet therapy. However, reviews of scientific research on magnet therapy consistently conclude that there is no evidence that magnets can relieve pain (Pittler & others, 2007; National Standard, 2009). Reviews by the National Center for Complementary and Alternative Medicine (2004, 2009) noted the following:

- Scientific research so far does not firmly support a conclusion that magnets of any type can relieve pain.
- The U.S. Food and Drug Administration (FDA) has not approved the marketing of magnets with claims of benefits to health (such as "relieves arthritis pain").


Read, Reason & REFLECT!

DR. PARMENTER'S MAGNETIC OIL! Will Cure Rheumatism!

TO THOSE AFFLICTED!

This Oil is warranted to ease more pain in less time, than any other medicine now in use. Call and test its Virtue; it removes the worst Rheumatic pain in 30 minutes; pains in the side, breast and back, in 20 minutes; Nervous Headache in 10 minutes; Croup in 20 minutes; Chilblains in one night, and is a sure cure for chapped hands. The Oil acts on the System on the principle of Electricity, regulates the whole system, and is perfectly safe in all cases. PRICE 25 CENTS PER BOTTLE.

PRINCIPAL DEPOT,

No. 9 Cooper's Buildings, cor. State & Green Sts., ALBANY, N. Y., and for sale by Druggists generally, throughout the United States and the Canadas. Druggists, Merchants and Peddlers supplied at the lowest prices,

By Dr. WM. O. PARMENTER.

The Granger Collection, New York

But proponents of magnet therapy, like those of almost all pseudoscientific claims, use very effective strategies to create the illusion of scientifically validated products or procedures. Each of the ploys below should serve as a warning sign that you need to engage your critical and scientific thinking skills.

Strategy I: Testimonials rather than scientific evidence

Pseudosciences often use testimonials or personal anecdotes as evidence to support their claims. The testimonials may seem genuine, like the comment by Brenda's son's therapist, who claimed that magnetic vests and mattresses had "worked miracles" for some of her patients. Although they may be sincere and often sound compelling, testimonials are not acceptable scientific evidence. Testimonials lack the basic controls used in scientific research. Many different factors, such as the simple passage of time, could account for a particular individual's response.

As you might expect, psychologists very carefully define the behaviors that they will observe and measure before they begin their research. Often, to increase the accuracy of the observations, two or more observers are used. In some studies, observations are recorded so that the researchers can carefully analyze the details of the behaviors being studied.

One advantage of naturalistic observation is that it allows researchers to study human behaviors that cannot ethically be manipulated in an experiment. For example, suppose that a psychologist wants to study bullying behavior in children. It would not be ethical to deliberately create a situation in which one child is aggressively bullied by another child. However, it *would* be ethical to study bullying by observing aggressive behavior in children on a crowded school playground (Drabick & Baugh, 2010).

As a research tool, naturalistic observation can be used wherever patterns of behavior can be openly observed—from the rain forests of the Amazon to restaurants, city streets, and classrooms. Because the observations occur in the natural setting, the results of naturalistic observation studies can often be generalized more confidently to real-life situations than can the results of studies using artificially manipulated or staged situations.

■ **pseudoscience** Fake or false science that makes claims based on little or no scientific evidence.

> Extraordinary claims require extraordinary evidence.
>
> *CARL SAGAN*

Strategy 2: Scientific jargon without scientific substance

Pseudoscientific claims are littered with scientific jargon to make their claims seem more credible. Vague references are made to "controlled studies," "scientific evidence," "scientists at a leading university," and so on. The ad copy may also be littered with scientific-sounding terms, such as "bio-magnetic balance" or impressive sounding scientific terms that, when examined, turn out to be meaningless.

Strategy 3: Combining established scientific knowledge with unfounded claims

Pseudosciences often mention well-known scientific facts to add credibility to their unsupported claims. For example, the magnet therapy spiel often starts by referring to the properties of the earth's magnetic field, the fact that blood contains minerals and iron, and so on. To further strengthen the illusion of scientific credibility, established scientific procedures are mentioned, such as *magnetic resonance imaging* (MRI). Or, they mention procedures currently being scientifically developed, such as *transcranial magnetic stimulation* (TMS). For the record, MRI and TMS do not use static magnets, which are the type sold on magnet therapy Web sites.

Strategy 4: Irrefutable or nonfalsifiable claims

Consider this claim: Magnet therapy restores the natural magnetic balance required by the body's healing process. How could you test that claim? An *irrefutable* or *nonfalsifiable claim* is one that cannot be disproved or tested in any meaningful way. The irrefutable claims of pseudosciences typically take the form of broad or vague statements that are essentially meaningless.

Strategy 5: Confirmation bias

Scientific conclusions are based on converging evidence from *multiple studies*, not a single study. Pseudosciences ignore this process and instead trumpet the findings of a single study that seems to support their claims. In doing so, they do *not* mention all the other studies that tested the same thing but yielded results that failed to support the claim. This illustrates *confirmation bias*—the tendency to seek out evidence that confirms a claim or belief, while ignoring evidence that contradicts or undermines the claim or belief (J. C. Smith, 2010). When disconfirming evidence is pointed out, it is ignored or explained away.

Strategy 6: Shifting the burden of proof

In science, the responsibility for proving the validity of a claim rests with the person making the claim. Many pseudosciences, however, *shift the burden of proof* to the skeptic. If you express skepticism about a pseudoscientific claim, the pseudoscience advocate will challenge you to *disprove* their claim.

Strategy 7: Multiple outs

What happens when pseudosciences fail to deliver on their promised benefits? Typically, multiple excuses are offered. Brenda's son, for example, did *not* experience any benefits from wearing the magnetic vest. Here are just some of the reasons given when magnet therapy fails to work:

- Magnets act differently on different body parts.
- The magnet was placed in the wrong spot.
- Everyone's body will respond differently to magnet therapy.
- The magnets were the wrong type, size, shape, etc.
- The magnets weren't strong enough.
- The magnets weren't worn long enough.
- The healing effect may not occur until after you stop using the magnets.

One of our goals in this text is to help you develop your scientific thinking skills so you're better able to evaluate claims about behavior or mental processes, especially claims that seem farfetched or too good to be true. In this chapter, we'll look at the scientific methods used to test hypotheses and claims. And in the Science Versus Pseudoscience boxes in later chapters, you'll see how various pseudoscience claims have stood up to scientific scrutiny. We hope you enjoy this feature!

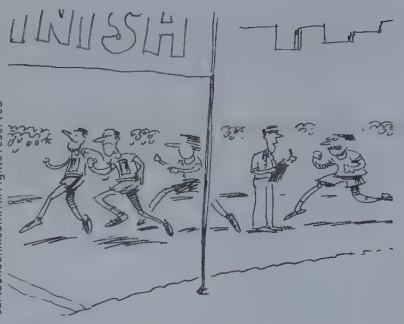
Case Studies

Details, Details, Details

A **case study** is an intensive, in-depth investigation of an individual, a family, or some other social unit. Case studies involve compiling a great deal of information from numerous sources to construct a detailed picture of the person. The individual may be extensively interviewed, and his or her friends, family, and coworkers may be interviewed as well. Psychological and biographical records, neurological and medical records, and even school or work records may be examined. Other sources of information can include psychological testing and observations of the person's behavior. Clinical psychologists and other mental health specialists routinely use case studies to develop a complete profile of a psychotherapy client.

Case studies are also used in psychological research investigating rare, unusual, or extreme conditions. These kinds of case studies often provide psychologists with information that can be used to help understand normal behavior. For example, the Chapter 3 Prologue features the story of Mike May, who partially regained his sight

■ **case study** An intensive study of a single individual or small group of individuals.



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"Hi. I'm doing a survey. Do you have a few minutes to answer some questions?"

after being blind since early childhood. You'll read how the information gained from extensive testing of Mike's brain and visual abilities has provided insights into brain and visual development in normally sighted individuals.

The case study method can also be used to study more than one individual. In *case-based research,* information from multiple case studies is systematically combined and analyzed (Lutz & Hill, 2009). Case-based research can be particularly valuable in clinical psychology, where it can be used to evaluate and improve treatment strategies for people with specific psychological disorders.

Surveys

(A) Always (B) Sometimes (C) Never (D) Huh?

A direct way to find out about the behavior, attitudes, and opinions of people is simply to ask them. In a **survey,** people respond to a structured set of questions about their experiences, beliefs, behaviors, or attitudes. One key advantage offered by survey research is that information can be gathered from a much larger group of people than is possible with other research methods.

Typically, surveys involve a carefully designed questionnaire in a paper-and-pencil format that is distributed to a select group of people. Computer-based or Internet-based surveys have become increasingly more common. Surveys are also conducted over the telephone or in person, with the interviewer recording the person's responses. The interviewer usually asks a structured set of questions in a predetermined order. Interview-based surveys are typically more expensive and time-consuming than questionnaire-based surveys.

Surveys are seldom administered to everyone within the particular group or population under investigation. Instead, researchers usually select a **sample**—a segment of the group or population. Selecting a sample that is representative of the larger group is the key to getting accurate survey results. A **representative sample** very closely parallels, or matches, the larger group on relevant characteristics, such as age, sex, race, marital status, and educational level.

How do researchers select the participants so that they end up with a sample that is representative of the larger group? The most common strategy is to randomly select the sample participants. **Random selection** means that every member of the larger group has an equal chance of being selected for inclusion in the sample.

To illustrate, let's look at the sample for the landmark *National Survey of Sexual Health and Behavior* (NSSHB). Conducted by researcher Michael Reece and his colleagues (2010) at Indiana University, the NSSHB focused on 40 different types of sexual behaviors, such as condom use and same-sex encounters. Respondents included 5,865 U.S. adolescents and adults between the ages of 14 and 94. Here is how random selection was used to choose the survey participants:

1. In a national survey like the NSSHB, the sample needs to be constructed so that it is representative of the U.S. population as a whole. Thus, the researchers first combined mail and telephone listings for all U.S. residents, creating a database of 98% of U.S households. In other words, almost every household in the country had an equal chance of being selected for inclusion in the sample.
2. A computer program was used to randomly select households from the entire population for the sample. Once a household was selected, an individual from that household was randomly selected to participate. In the NSSHB study, researchers used birthdays as a selection criterion. Reasoning that birth dates are randomly occurring events, they arbitrarily invited the person with the most recent birthday to participate (NSSHB, 2011; Knowledge Networks, 2010). If that individual declined, they went on to a different household. People were not allowed to volunteer for the study.

How closely did the NSSHB sample match important characteristics of the U.S. population? You can see for yourself by comparing the two columns in Table 1.1.

TABLE 1.1

Comparing the NSSHB Sample and the U.S. Population

	NSSHB Sample	United States Population
Gender		
Men	49.2%	48.0%
Women	50.8%	52.0%
Age		
18–24	9.8%	13.2%
25–34	19.1%	18.7%
35–44	22.8%	22.1%
45–54	19.8%	18.3%
55–64	13.4%	11.6%
65–74	9.7%	8.7%
75+	5.5%	7.4%
Education		
Some high school	12.3%	16.9%
High school graduate	33.5%	32.8%
Some college	28.5%	19.8%
College graduate	18.2%	23.0%
Postgraduate work	7.4%	7.5%
Race		
White	82.8%	83.3%
African American	10.0%	11.9%
Other	7.2%	4.8%

Source: Chang & Krosnick (2009).

Using random selection, approximately 6,000 people were chosen for the sample used in the National Survey of Sexual Health and Behavior (NSSHB). The overall characteristics of the NSSHB sample are highly representative of the U.S. population as a whole.

Clearly, the random selection process used in the NSSHB resulted in a sample that very closely approximated the characteristics of the U.S. population as a whole.

One potential problem with surveys and questionnaires is that people do not always answer honestly, especially when they are asked questions about sexual activity, substance abuse, drug use, or illegal activities. Participants may misrepresent their personal characteristics or behavior. Some may even lie in their responses.

The tendency to respond in socially desirable ways can be addressed in a carefully designed survey. One strategy is to rephrase the question and ask for the same information in a different way at different points during the survey. Researchers can then compare the responses to make sure that the participant is responding honestly and consistently.

There is also evidence that people are more likely to respond honestly when they take computer-administered surveys than when they are questioned over the telephone or in person. Because computer surveys feel more anonymous and confidential, participants may feel less constrained to respond in socially appropriate ways (Dennis & Li, 2007).

For example, participants in the NSSHB responded to questions by logging into a secure Internet site (Reece & others, 2010). Noting differences between their results and earlier surveys, NSSHB researchers suggested that participants may have been more comfortable reporting sexual behaviors over the Internet rather than discussing them in person or over the telephone as was done in earlier studies (Herbenick & others, 2010).

survey A questionnaire or interview designed to investigate the opinions, behaviors, or characteristics of a particular group.

sample A selected segment of the population used to represent the group that is being studied.

representative sample A selected segment that very closely parallels the larger population being studied on relevant characteristics.

random selection Process in which subjects are selected randomly from a larger group such that every group member has an equal chance of being included in the study.

correlational study A research strategy that allows the precise calculation of how strongly related two factors are to each other.

correlation coefficient A numerical indication of the magnitude and direction of the relationship (the *correlation*) between two variables.

Correlational Studies

Looking at Relationships and Making Predictions

KEY THEME

› Correlational studies show how strongly two factors are related.

KEY QUESTIONS

› What is a correlation coefficient?

› What is the difference between a positive correlation and a negative correlation?

› Why can't correlational studies be used to demonstrate cause-and-effect relationships?

Along with answering the *who, what, where,* and *when* questions, the data gathered by descriptive research techniques can be analyzed to show how various factors are related. A **correlational study** examines how strongly two variables are related to, or associated with, each other. Correlations can be used to analyze the data gathered by *any* type of descriptive method.

To illustrate, let's look at a correlational study conducted by psychologists Craig Anderson and Karen Dill (2000). Anderson and Dill were interested in how much time young people spent playing video games. They surveyed more than 200 students taking introductory psychology classes at a large midwestern university. Figure 1.3 shows some of the survey results. The students also completed some personality tests and a questionnaire on past delinquent behavior. Finally, each student's cumulative grade point average was obtained. Once the data were collected, Anderson and Dill used a statistical procedure to calculate a figure called a *correlation coefficient.*

A **correlation coefficient** is a numerical indicator of the strength of the relationship between two factors. A correlation coefficient always falls in the range from −1.00 to +1.00. The correlation coefficient has two parts—the number and the sign. The number indicates the *strength* of the relationship, and the sign indicates the *direction* of the relationship between the two variables.

More specifically, the closer a correlation coefficient is to 1.00, whether it is positive or negative, the stronger the correlation or association is between the two factors.

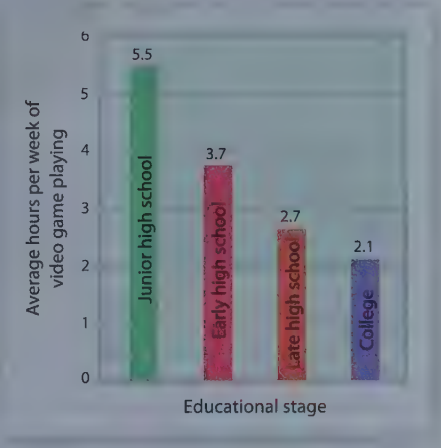


FIGURE 1.3 Time Spent Playing Video Games Anderson and Dill's (2000) survey of 227 college students revealed that the amount of time participants spent playing video games decreased as they attained higher education. Notice that even at the college level, students reported playing video games for more than two hours per week on the average.



Jim West / The Image Works

Jazzing Up Your Love Life with Correlation Coefficients Using data from the University of Chicago's ongoing General Social Survey, researchers John Robinson and Geoffrey Godbey (1998) discovered that adult sexual behavior was positively correlated with certain musical preferences. After controlling for age and race, the researchers found that people who have a strong preference for jazz are 30 percent more sexually active than the average American. Liking other types of music, such as rock or rap, was unrelated to sexual activity. Does this mean that listening to jazz *causes* an increase in sexual activity? Not necessarily. Remember, a correlation between two factors does not necessarily indicate causality—only that the two factors co-vary in a systematic way.

Hence, a correlation coefficient of +.90 or −.90 represents a very strong association, meaning that the two factors almost always occur together. A correlation coefficient of +.10 or −.10 represents a very weak correlation, meaning that the two factors seldom occur together. (Correlation coefficients are discussed in greater detail in Appendix A, on Statistics, at the back of this book.)

Notice that correlation coefficients do not function like the algebraic number line. A correlation of −.80 represents a stronger relationship than does a correlation of +.10. The plus or minus sign in a correlation coefficient simply tells you the direction of the relationship between the two variables.

A **positive correlation** is one in which the two factors vary in the *same* direction. That is, the two factors increase or decrease together. For example, Anderson and Dill found that there was a positive correlation of +.22 between the amount of time spent playing violent video games and aggressive personality characteristics. That is, as the amount of time spent playing violent video games *increased,* aggression scores on personality tests *increased.*

In contrast, a **negative correlation** is one in which the two variables move in opposite directions: As one factor decreases, the other increases. In analyzing their results, Anderson and Dill found that there was a *negative* correlation of −.20 between the amount of time spent playing video games and academic achievement, as measured by cumulative college grade point average. Thus, as the amount of time spent playing video games *increased,* college grade point average *decreased.*

Given this basic information about correlation coefficients, what can we conclude about the relationship between the time spent playing video games and academic achievement? Or about exposure to violent video games and aggressive personality characteristics? Does the evidence allow us to conclude that playing video games *causes* a decrease in grade point average? Or that playing violent video games *causes* people to develop more aggressive personalities?

Not necessarily. For example, even if playing video games and getting poor grades were very strongly correlated, it's completely possible that some other factor is involved. For example, it could be that students who lack academic motivation tend to spend their free time playing video games rather than studying. Thus, it might be that a lack of academic motivation, rather than video games, is responsible for lower grades.



Joel Wintermantle/Alamy



Paul Almasy/Corbis

A Perfect Positive Correlation: The Clock and the Bell Tower If a +1.00 correlation occurred between two variables, it would be termed a *perfect positive correlation.* This means that every time Factor A occurred, Factor B would also occur. This might seem to suggest that Factor A is causing Factor B to occur, but that's not necessarily the case. For example, every time the big hand on the clock tower gets to 12, two miles away the bell starts ringing. The two events are perfectly correlated yet, in this case, one does not cause the other.

Similarly, consider the positive correlation between aggressive personality and amount of time spent playing violent video games. We cannot conclude that playing violent video games *causes* an increase in aggression. It's entirely possible that people who are more aggressive are attracted to violent video games or enjoy playing them. Thus, it could be that people with aggressive personalities are more likely to spend more time playing violent video games than people who are less aggressive.

Here is the critical point: Even if two factors are very strongly correlated, *correlation does not necessarily indicate causality.* A correlation tells you only that two factors seem to be related or that they co-vary in a systematic way. Although two factors may be very strongly correlated, correlational studies cannot be used to demonstrate a true cause-and-effect relationship. As you'll see in the next section, the experimental method is the only scientific strategy that can provide compelling evidence of a cause-and-effect relationship between two variables.

Even though you can't draw conclusions about causality from it, correlational research can be very valuable. First, correlational research can be used to rule out some factors and identify others that merit more intensive study. Second, the results of correlational research can sometimes allow you to make meaningful predictions. For example, when Anderson and Dill (2000) analyzed data from their survey, they discovered that there was a moderately strong correlation of +.46 between the amount of time spent playing violent video games and aggressive delinquent behavior, such as damaging public or private property. That is, the more time that was spent playing violent video games, the higher

was the incidence of aggressive delinquent behavior. Looking at the overall results of their survey, Anderson and Dill concluded that there *were* legitimate reasons to be concerned about the potential negative consequences of long-term or excessive exposure to video games, especially violent video games. In Chapter 5, on learning, we'll take a critical look at the relationship between exposure to violent media and aggressive behavior.

CONCEPT REVIEW 1.5

Descriptive Research Methods

Fill in each blank with one of these terms: naturalistic observation, the case study method, correlational research, positive correlation, negative correlation.

1. A psychologist discovers that as negative life events increase, episodes of depression also increase. The psychologist concludes that there is a _____ between negative life events and episodes of depression.
2. A psychologist is interested in what hospital staff members say about their patients in public. His research assistants spend four hours riding elevators in various hospitals and unobtrusively recording the public conversations. This psychologist is using _____.
3. A psychologist is using police reports and weather reports to determine whether there is any relationship between the frequency of arrests for aggressive behavior and the temperature. She is using _____ to study this relationship.
4. Researchers have found that the more credit cards people have, the less money they tend to have in their savings accounts. These researchers have discovered a _____ between the number of credit cards and the amount of savings.
5. Dr. Romano conducts an in-depth interview and gives extensive psychological tests to an individual who claims to have been abducted by aliens. Dr. Romano is using _____ in this investigation.

The Experimental Method

KEY THEME

› The experimental method is used to demonstrate a cause-and-effect relationship between two variables.

KEY QUESTIONS

› What roles do the independent variable and dependent variable play in an experiment?

› How can experimental controls help minimize the effects of extraneous variables?

› How can the placebo effect and practice effect influence experimental results?

The **experimental method** is a research method used to demonstrate a cause-and-effect relationship between changes in one variable and the effect that is produced on another variable. Conducting an experiment involves deliberately varying one factor, which is called the **independent variable.** The researcher then measures the changes, if any, that are produced in a second factor, called the **dependent variable.** The dependent variable is so named because changes in it depend on variations in the independent variable.

To the greatest degree possible, all other conditions in the experiment are held constant. Thus, when the data are analyzed, any changes that occur in the dependent variable can be attributed to the deliberate manipulation of the independent variable. In this way, an experiment can provide evidence of a cause-and-effect relationship between the independent and dependent variables.

In designing experiments, psychologists try to anticipate and control for **extraneous variables.** Also called *confounding variables,* these factors are not the focus of the experiment. However, extraneous, or confounding, variables might produce inaccurate experimental results by influencing changes in the dependent variable. Depending on the question being investigated, potential extraneous variables in a psychology experiment could include unwanted variability in such factors as the participants' ages, gender, ethnic background, race, health, occupation, personal habits, education, and so on.

positive correlation A finding that two factors vary systematically in the same direction, increasing or decreasing together.

negative correlation A finding that two factors vary systematically in opposite directions, one increasing as the other decreases.

experimental method A method of investigation used to demonstrate cause-and-effect relationships by purposely manipulating one factor thought to produce change in another factor.

independent variable The purposely manipulated factor thought to produce change in an experiment; also called the *treatment variable.*

dependent variable The factor that is observed and measured for change in an experiment; thought to be influenced by the independent variable; also called the *outcome variable.*

extraneous variable A factor or variable other than the ones being studied that, if not controlled, could affect the outcome of an experiment; also called a *confounding variable.*

experimental group or **experimental condition** In an experiment, the group of participants who are exposed to all experimental conditions, including the independent variable.

placebo A fake substance, treatment, or procedure that has no known direct effects.

Even though researchers try to minimize unwanted influences and variability, it is impossible to control every aspect of an experimental situation. That's why researchers use various *experimental controls*. These are specific strategies and procedures that help minimize the possibility that extraneous variables or some other uncontrolled factor will influence the outcome of the experiment.

The Ginkgo Biloba Experiment

Testing for Effectiveness

The design of an experiment depends on the hypothesis being investigated. For example, some experiments are designed to assess the effectiveness of a therapeutic treatment, such as a medication, a type of psychotherapy, or some other procedure (like wearing a magnetic vest or sleeping on a magnetic mattress). In this type of experiment, participants assigned to the **experimental group** receive the independent variable—the actual medication, therapy, or procedure. The independent variable is also sometimes referred to as the *treatment variable*.

Other participants are assigned to a *placebo control group* and receive a **placebo.** A placebo is a fake substance, treatment, or procedure that has no known direct effects. It *looks* just like the real independent variable—the actual drug or treatment. But despite its convincing appearance, it is a sham, a fake, a sugar pill masquerading as the real deal.

Although it is completely inactive, a placebo can produce very real effects. A **placebo effect** is any change attributed to the person's beliefs and expectations rather than an actual drug, treatment, or procedure. Also called *expectancy effect,* the potential influence of placebo effect should not be underestimated. For example, in one study, participants exposed to placebo poison ivy displayed real and painful responses: outbreaks of skin rashes (see Crum & Langer, 2007).

In a typical therapeutic effectiveness experiment, participants are told that they have a 50–50 chance of receiving the actual versus the placebo treatment. For example, psychologist Paul Solomon and his colleagues (2002) used a placebo control group to test whether an herb called *ginkgo biloba* improves memory, concentration, and mental focus in older adults. Participants in the experimental group took the manufacturer's recommended daily dosage of ginkgo biloba for six weeks, while those in the placebo control group took an identical dosage of placebo capsules. Memory and other cognitive abilities were assessed at the beginning and end of the six-week study, as shown in the experimental design in Figure 1.4.

The participants in the ginkgo study were randomly assigned to the different conditions. **Random assignment** means that all the participants have an equal chance of being assigned to any of the experimental groups or conditions. Random assignment helps ensure that any potential differences among the participants are spread out evenly across all experimental conditions. Random assignment also helps minimize the possibility of bias because the same criteria are used to assign all participants to the different experimental groups.

Using a **double-blind technique** is another experimental control in therapeutic effectiveness studies. This means that both the participants and the researchers interacting with them are *blind,* or unaware of the treatment or condition to which the participants have been assigned. For example, in the ginkgo biloba study, the researchers who interacted with the participants did not know which participants received the real or fake ginkgo biloba. The researchers who did know the group assignments did *not* interact with or evaluate the participants. In contrast, a *single-blind study* is one in which the researchers, but not the subjects, are aware of critical information.

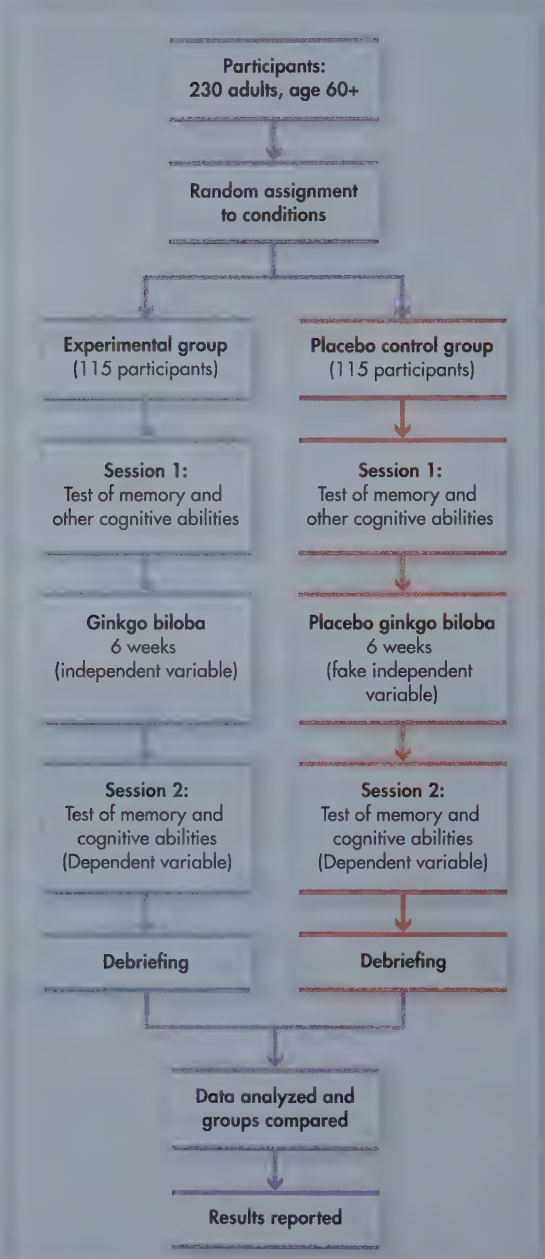


FIGURE 1.4 The Ginkgo Biloba Study Experimental Design

Using a double-blind technique helps guard against the possibility that the researcher inadvertently becomes an extraneous or confounding variable in the study. This can happen when a researcher, without realizing it, displays **demand characteristics.** These are subtle cues or signals that can bias the outcome of the study by communicating the behavior or response that is expected of the participants. A behavior as subtle as the researcher slightly smiling or frowning when dealing with some participants, but not others, could bias the outcome of a study.

Can you predict the results of the ginkgo biloba experiment? At the end of the six-week study, the test scores of *both* groups rose. However, there were no significant differences between the improvement in the ginkgo biloba and placebo groups. So why did both groups improve? The researchers concluded that it was probably due to **practice effect.** The participants' experience with the tests—the practice they got by simply taking the mental ability tests twice—was the most likely reason that test scores improved in both groups.

The ginkgo biloba experiment illustrates that before any kind of treatment can be claimed as effective, changes caused by placebo effect, practice effect, and other influences must be identified. Only after accounting for changes caused by those effects can you determine the **main effect**—the change that can be directly attributed to the treatment variable.



Joe Raedle/Getty Images

Can Ginkgo Biloba Enhance Your Mental Abilities? The herbal supplement *ginkgo biloba* is marketed as a "cognitive enhancer" that supposedly improves memory, alertness, and concentration, especially in older adults. However, studies of ginkgo don't support those claims (see Canter & Ernst, 2007; Daffner, 2010; Snitz & others, 2009).

The Hotel Experiment

Can Perceiving Work as Exercise Produce Health Benefits?

KEY THEME

› Psychological research has found that a person's beliefs and expectations can exert a significant influence on health and well-being.

KEY QUESTIONS

› What were the independent and dependent variables in Crum and Langer's experiment?

› What were the results in Crum and Langer's hotel experiment?

› What implications are suggested by the results in Crum and Langer's experiment?

Testing for therapeutic effectiveness represents a classic experimental design involving a placebo control group. Let's look at a different experimental design, which was inspired by this clue from previous research: Elderly people who *believed* that their health was "poor" were six times more likely to die than those who perceived their health as "excellent." This pattern held true regardless of their *actual* state of physical health (Idler & Kasl, 1991).

This association was found in a correlational study. More specifically, the researchers found a positive correlation between "perception of health status" and "length of survival." But as we explained earlier, correlational evidence *cannot* be used to draw conclusions about cause-and-effect relationships. Only an experiment can provide the scientific evidence needed to show that a causal relationship exists between two variables.

So how could you design an experiment to test the notion that a change in belief (the independent variable) produces a change in health (the dependent variable)? Ethically, of course, you could not conduct an experiment in which you deceived people by telling them that their health had suddenly become "poor" or "good," and then wait to see how long the participants survived. Besides, if you told people that their health had changed for better or worse, they might start behaving differently—a potential confounding variable. Instead, the challenge in testing this notion would be to just change a person's beliefs without changing their behavior. Is that even possible? Could it be done experimentally?

placebo effect Any change attributed to a person's beliefs and expectations rather than an actual drug, treatment, or procedure; also called *expectancy effect.*

random assignment The process of assigning participants to experimental conditions so that all participants have an equal chance of being assigned to any of the conditions or groups in the study.

double-blind technique An experimental control in which neither the participants nor the researchers interacting with the participants are aware of the group or condition to which the participants have been assigned.

demand characteristics In a research study, subtle cues or signals expressed by the researcher that communicate the kind of response or behavior that is expected from the participant.

practice effect Any change in performance that results from mere repetition of a task.

main effect Any change that can be directly attributed to the independent or treatment variable after controlling for other possible influences.

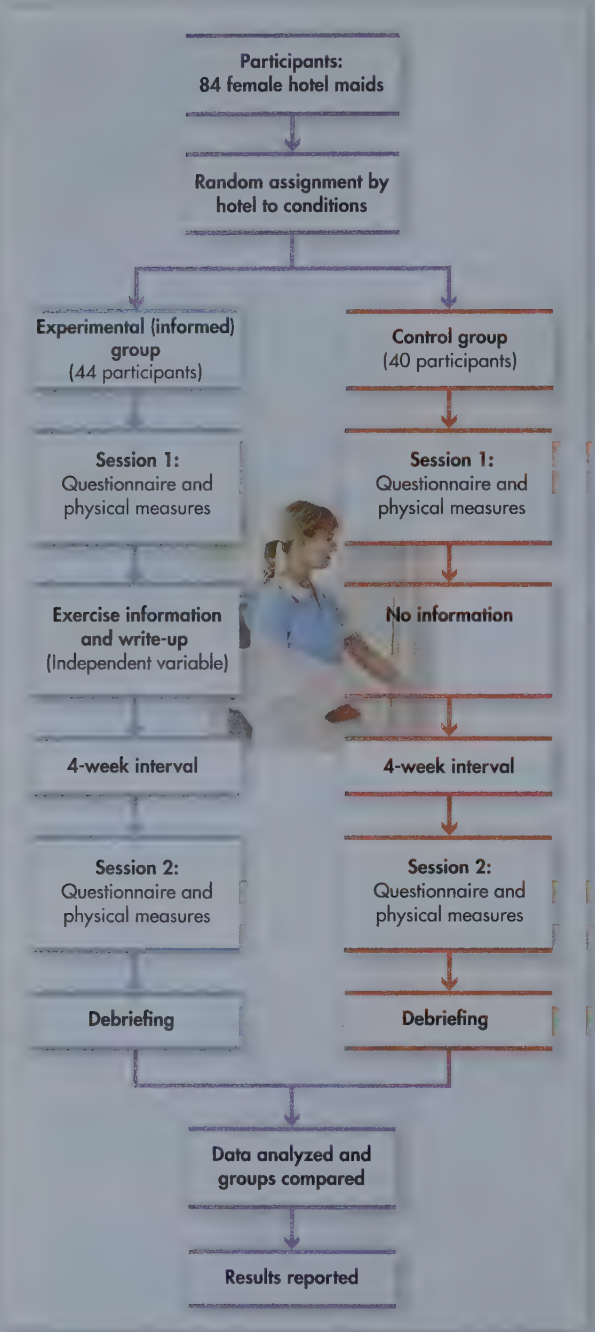


FIGURE 1.5 The Hotel Study Experiment Design

The Hypothesis and Participants

That was the challenge faced by Harvard psychologists Alia Crum and Ellen Langer. Crum and Langer (2007) wanted to test the hypothesis that changing a person's beliefs and expectations about the exercise benefits of a particular activity would result in actual health benefits.

The participants in Crum and Langer's experiment were recruited from the housekeeping staff at seven carefully matched hotels. All of the 84 women in the study cleaned an average of 15 hotel rooms per day, spending about 20 to 30 minutes on each room. Although you might not think of room cleaning as healthy physical exercise, vacuuming, making beds, scouring bathrooms, bending, stooping, and pushing heavy supply carts requires a good deal of physical exertion.

A potential confounding variable was that the housekeeping staff at a particular hotel might talk to each other about being in the study. This meant that the participants at the different hotels could not be individually assigned to the experimental or control groups. Instead, each hotel was randomly assigned to either the experimental or the control condition (see Figure 1.5). Thus, all of the participants at a given hotel were assigned to the same group.

All of the participants were told that the experimenters were interested in getting information on their health so that they could study ways to improve it. In return for their help, the participants would receive information about research on health and happiness at the end of the study.

The Independent Variable, Experimental Group, and Control Group

In Crum and Langer's experiment, the independent variable was being informed that housekeeping work was good exercise. Hence, the participants in the experimental group were dubbed "the informed group."

The informed group participants received a write-up discussing the benefits of exercise. It was explained that their daily housekeeping chores satisfied, and even exceeded, government recommendations for healthy daily exercise to burn at least 200 calories. The average calories expended for different housekeeping activities were also detailed. For example, changing bed linens for 15 minutes burns 40 calories, vacuuming a room burns 50 calories, and so forth.

The write-ups were read and explained to the staff. Each informed group participant also received a printed copy. And large posters with the information were displayed on the bulletin boards in the staff lounge. The posters functioned as a daily reminder of how much exercise the staff was getting in performing their housekeeping duties.

In any well-designed experiment, there is at least one control group. The **control group** serves as a baseline against which changes in the experimental group can be compared. In a typical experiment, the participants assigned to the control group go through all the experimental phases but are *not* exposed to the independent variable. In Crum and Langer's experiment, the control group consisted of the participants who were *not* informed that their housekeeping work was beneficial healthy exercise.

■ **control group** or **control condition** In an experiment, the group of participants who are exposed to all experimental conditions, except the independent variable; the group against which changes in the experimental group are compared.

The Dependent Variables and Experimental Procedure

Several dependent variables were measured for change. All participants completed a questionnaire about whether they exercised regularly, how much exercise they got, where they got their exercise, and so on. It was noted whether participants already perceived their work-related activities as exercise. The questionnaire responses were

used as measures of *self-reported exercise* and to determine if participants *perceived work as exercise*. The questionnaire also asked about their diet during the previous month and personal habits, such as alcohol use and smoking.

Each participant also completed various measures of physical health, including weight, percentage of body fat, body mass index (BMI), waist-to-hip ratio, and blood pressure. After the measurements, the participants in the informed group were given the information and handouts about how their work was good exercise. The participants in the control group were not given this information.

During the month-long study, all other conditions were held constant. The hotel management confirmed that the workload of the housekeeping staff remained constant throughout the study. At the end of four weeks, the questionnaire and measures of physical health were administered again.

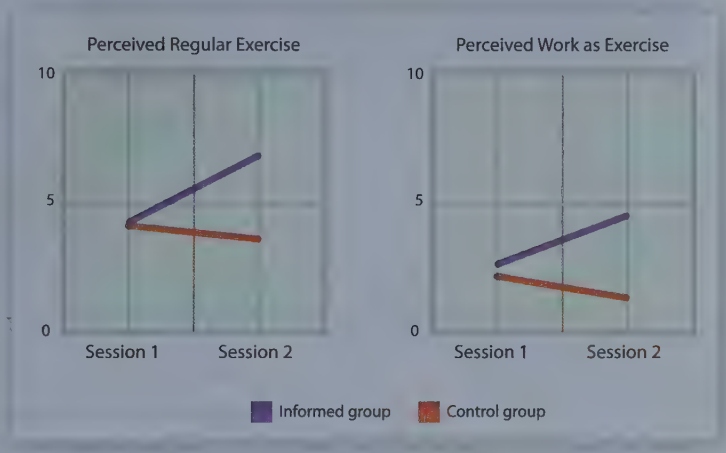


FIGURE 1.6 Changes in Perception of Exercise in Hotel Experiment The two graphs below show the changes in the perceptions of the experimental group participants, who were informed about the health benefits of work-related exercise during the first session. Even though their behavior at work and outside of work did not change, the new information increased their perceptions of how much regular exercise they were getting and that work-related tasks were a form of exercise. In comparison, perceptions were unchanged in the control group participants, who did not receive information about the health benefits of work-related exercise.

The Results

Crum and Langer used a variety of statistical measures to analyze the data they collected. Here are the experiment's key findings:

- Participants in both groups reported no changes in exercise outside of work, or in their eating, drinking, or other personal habits.
- The informed group reported higher levels of *perceived exercise* even though their actual exercise activity levels at work and outside of work did *not* change (see Figure 1.6). The informed group also changed their perception of their work-related activities. The physical activities they engaged in at work were now perceived as exercise. In contrast, the work-related perceptions of the control group did not change.
- The informed group participants showed significant improvements over the course of the study in all physical health measures except diastolic blood pressure (see examples in Figure 1.7). In contrast, none of the health measures for the control group participants showed significant changes.

Crum and Langer (2007) noted that the informed group's change in belief and expectations was accompanied by some remarkable health improvements:

> After only 4 weeks of knowing that their work is good exercise, the subjects in the informed group lost an average of 2 pounds, lowered their systolic blood pressure by 10 points, and were significantly healthier as measured by body-fat percentage, body mass index, and waist-to-hip ratio. These results support the hypothesis that increasing perceived exercise independently of actual exercise results in subsequent physiological improvements.

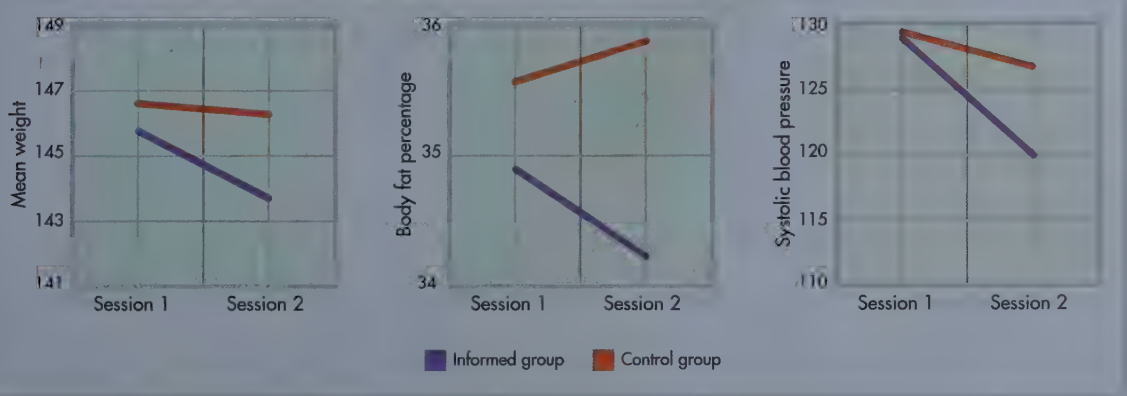


FIGURE 1.7 Changes in Physiological Variables in Hotel Experiment Just four weeks after being told about the health benefits of work-related exercise, the informed group participants showed significant improvements on several health measures, including weight, percentage of body fat, and blood pressure. Control group participants, who were not told about the health benefits of work-related exercise, showed no changes on the same measures.

Reporting the Findings

Crum and Langer's study was published in *Psychological Science,* the leading journal of the Association of Psychological Science (APS). The APS news release about their experiment attracted considerable attention from print and online media.

One criticism of the study is that members of the informed group might have behaved differently after being told about the benefits of exercise (Spiegel, 2008). Even though the informed group reported no changes in their behavior or diet, subtle changes may have occurred, such as eating healthier foods, walking more, and so forth. To investigate that possibility, Crum is planning a longer study that would monitor physical activity using pedometers and track food consumption using daily logs.

In combination, the ginkgo biloba experiment and the hotel experiment demonstrate the powerful influence that can be played by people's beliefs and expectations. Could beliefs and expectations play a role in the testimonials of people who hail the effectiveness of unproven magnetic products, such as rings, bracelets, vests, and mattresses? Absolutely.

But other factors could also be involved in the changes that people often report in response to pseudoscientific products or procedures, such as magnet therapy or subliminal motivation CDs (see Chapter 3). For example, the body's natural healing processes can produce changes with the simple passage of time. Further, many psychological or physical conditions cycle up and down, leading to temporary improvements. In later chapters, we'll look at other factors that can contribute to an appearance of effectiveness in unsupported pseudoscientific claims.

Limitations of Experiments and Variations in Experimental Design

A well-designed and carefully executed experiment can provide convincing evidence of a cause-and-effect relationship between the independent and dependent variables. But experiments do have limitations. Because experiments often conducted in highly controlled laboratory situations, they are sometimes criticized for having little to do with actual behavior. That is, the results may not *generalize* well, meaning that the results cannot be applied to real-world situations or to more general populations beyond the participants in the study. To minimize this, experiments are sometimes carried out in natural settings, as was done in the hotel experiment, rather than in a laboratory.

A second potential limitation is that the phenomena the researchers want to study may be impossible or unethical to control experimentally. For example, a psychologist might want to know whether prolonged exposure to a noisy urban environment creates psychological and physical stress in young children. Obviously, it would be unethical to subject children to loud noise for a prolonged period of time.

But researchers are sometimes able to take advantage of naturally occurring events or conditions. In a **natural experiment,** researchers carefully observe and measure the impact of a naturally occurring event or condition on their study participants (Rutter, 2008). Although not true experiments, psychologists can use natural experiments to study the effects of disasters, epidemics, or other events. For example, psychologist Gary Evans and his colleagues (1998, 2007) used a natural experiment to study the effects of airport noise on children. They found that stress levels *increased* in children after a large, international airport was built in their once-quiet community–and *decreased* in the community where an older airport was closed after the new one opened (Evans & Hygge, 2007; Hygge & others, 2002).

Sometimes natural experiments involve everyday settings. Psychologists Kandice Kapinos and Olga Yakusheva (2011) were interested in better understanding the relationship between environmental factors and weight gain. Previous research had shown that environmental factors, such as high concentrations of fast food restaurants, *are* correlated with the average weight of nearby residents (Inagami & others,

natural experiment A study investigating the effects of a naturally occurring event on the research participants.

2009). However, since the research was correlational, it wasn't possible to conclude that proximity of fast food restaurants *caused* weight gain. It could be that people with unhealthy eating habits were more likely to choose to live in neighborhoods with easy access to fast food.

Of course, researchers can't randomly assign large numbers of participants to long-term living situations. But Kapinos and Yakusheva identified a naturally occurring situation in which people *are* randomly assigned to housing—college dormitories.

College freshmen do tend to gain weight during their first year away from home—the so-called "freshman fifteen"—although the weight gain is typically closer to five pounds (Holm-Denoma & others, 2008). Kapinos and Yakusheva took advantage of the naturally occurring conditions on their own college campus by comparing weight changes in freshmen who lived in dorms with on-site cafeterias and snack bars with weight changes in freshman who lived in dorms that did *not* have on-site food services. Since freshmen were randomly assigned to the dormitories, the researchers could safely assume that there wasn't some other factor that might cause differences between the two groups.

What did Kapinos and Yakusheva (2010) find? Female students who were assigned to dormitories with on-site dining facilities gained more weight and exercised less than students who were assigned to dormitories without food services. Male students assigned to dormitories with food service reported eating more meals and more snacks, but did not report gaining weight. Kapinos and Yakusheva (2011) concluded that campus design *did* play a significant role in influencing healthy—and unhealthy—behaviors in college students.

Before leaving the topic of research methods, one contemporary trend deserves special mention: the increasing use of brain-imaging techniques in virtually every area of psychology. To help highlight the importance of neuroscience, every chapter includes a special "Focus on Neuroscience" feature. This chapter's Focus on Neuroscience explores brain-imaging techniques and discusses their increasing use in psychological research (see pp. 34–35).



Suzanne DeChillo/The New York Times/Redux

Using a Natural Experiment to Study the "Freshman Fifteen"

Research shows that many college freshman *do* gain weight, although it is typically closer to five pounds than fifteen (Holm-Denoma & others, 2008). Kandice Kapinos and Olga Yakusheva (2011) used a natural experiment to study the effect of environmental factors on weight gain in college freshmen. Not surprisingly, freshman students who lived in a dorm with an on-site snack bar or cafeteria were more likely to eat more and gain weight than freshman who had to walk across campus for meals and snacks.

CONCEPT REVIEW 1.4

The Experimental Method

Match each component of the ginkgo biloba experiment and the hotel experiment to the correct term. Choose from the following terms:

a. independent variable
b. random assignment
c. control group
d. extraneous variable
e. dependent variable
f. main effect
g. practice effect
h. placebo
i. double-blind technique

_____ 1. Having an equal chance of being assigned to one of the different experimental conditions in both the ginkgo and hotel experiments.

_____ 2. Fake capsules that were identical in appearance to the actual ginkgo biloba capsules.

_____ 3. The fact that neither the participants nor the researchers who interacted with them knew which participants received the real ginkgo biloba and which received the fake ginkgo biloba.

_____ 4. Being informed that housekeeping tasks were good exercise.

_____ 5. Weight, blood pressure, body mass index, and other physical health measures of the hotel housekeeping staff.

_____ 6. The improvement that occurred from simply having taken the tests of memory, concentration, and mental focus twice.

_____ 7. The physical changes that could be directly attributed to being told that housekeeping tasks provided healthy exercise.

_____ 8. If several participants in the hotel experiment control group had lost weight due to a contagious intestinal virus.

_____ 9. The participants who were not told that housekeeping tasks provide healthy exercise.

FOCUS ON NEUROSCIENCE

Psychological Research Using Brain Imaging

Brain-scan images have become so commonplace in news articles and popular magazines that it's easy to forget just how revolutionary brain-imaging technology has been to the field of psychology (Cacioppo & others, 2008; Lorig, 2009). Here, we'll look at three commonly used brain-imaging techniques and how they're used in psychological research.

Positron emission tomography, abbreviated **PET,** is based on the fact that increased activity in a particular brain region is associated with increased blood flow and energy consumption. A small amount of radioactively tagged glucose, oxygen, or other substance is injected into the person's bloodstream. Then, the person lies in a PET scanner while performing some mental task. For several minutes, the PET scanner tracks the amounts of radioactive substance used in thousands of different brain regions. A computer analyzes the data, producing color-coded images of the brain's activity.

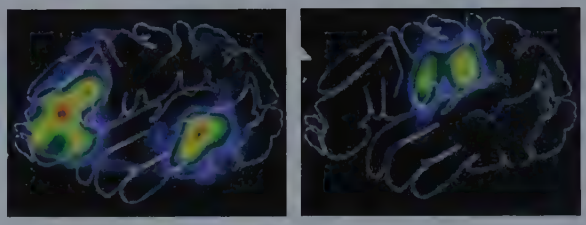
Magnetic resonance imaging (MRI) does not involve invasive procedures such as injections of radioactive substances. Instead, while the person lies inside a magnetic tube, powerful but harmless magnetic fields bombard the brain. A computer analyzes the electromagnetic signals generated by brain tissue molecules in response to the magnetic fields. The result is a series of digital images, each a detailed "slice" of the brain's structures. MRI scans are routinely used in medicine to produce detailed images of other body parts, such as joints, spine, or organs.

Functional MRI (fMRI) combines the ability to produce a detailed image of the brain's structures with the capacity to track the brain's activity or functioning. While the person lies in the MRI scanner, a powerful computer tracks the electromagnetic signals that are generated by changes in the brain's metabolic activity, such as increased blood flow to a particular brain region. By measuring the ebb and flow of oxygenated blood in the brain, an fMRI produces a series of scans that show detailed moment-by-moment "movies" of the brain's changing activity in specific structures or regions.

In the study of brain activity, functional MRI has several advantages over PET scan technology. Because fMRI is a noninvasive procedure and the magnetic waves are harmless, research participants can safely undergo repeated fMRI scans. fMRI produces a much sharper image than PET scans and can detail much smaller brain structures. Another advantage of fMRI is that it provides a picture of brain activity averaged over seconds rather than the several minutes required by PET scans.

How Psychologists Use Brain-Imaging Technology

Brain imaging is used for both descriptive and experimental research. A descriptive study using brain scans might compare the brain structure or functioning of one carefully defined group of people with another.



Dr. Marcus E. Raichle, Professor of Radiology & Neurology/Washington University School of Medicine

Unpracticed **Practiced**

Positron Emission Tomography (PET) PET scans provide color-coded images of the brain's activity. This example shows the comparison between subjects learning a new language task (left) and performing the language task after it has been well-learned (right). Red and yellow highlight areas with the highest level of activity while green and blue colors indicate lower levels of brain activity. As you can see, the process of practicing and learning a new language task involves more and different brain areas before becoming established.

For example, MRI scans were used to compare London taxi drivers with matched participants who were not taxi drivers (Maguire & others, 2000, 2006). In order to be licensed, London taxi drivers are required to have an encyclopedic knowledge of the city streets. The MRI scans showed that a brain structure involved in spatial memory, the *hippocampus*, was significantly larger in the experienced taxi drivers than in the control subjects (see MRI scans on the next page). And, the size of the hippocampus was also positively correlated with the length of time the participants had been driving taxis in London: the longer the individual had been driving a taxi, the larger the hippocampus (Woollett & others, 2009). In Chapter 2, Neuroscience and Behavior, we'll look at how the brain changes in response to learning and environmental influences.

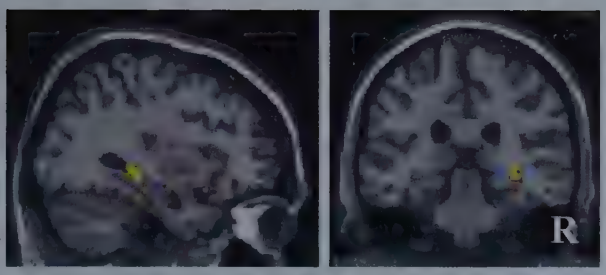
Brain-imaging technology can also be used in experimental research, such as the study of the effects of sleep deprivation illustrated on the next page. In a typical experiment, brain scans are taken while research participants are exposed to the experimental treatment or task. These scans are compared to scans taken of control group participants. The differences between the two sets of scans are assumed to be due to the experimental treatment or condition. When multiple participants are compared, researchers combine the results from multiple subjects to produce a composite scan showing the average differences.

Limitations of Brain-Imaging Studies

Images are becoming even more detailed as brain-imaging technology advances. Nevertheless, brain-imaging research has potential limitations (Miller, 2010; Vul & others, 2009). When you consider the results of brain-imaging studies, including those presented in this textbook, keep the following points in mind:

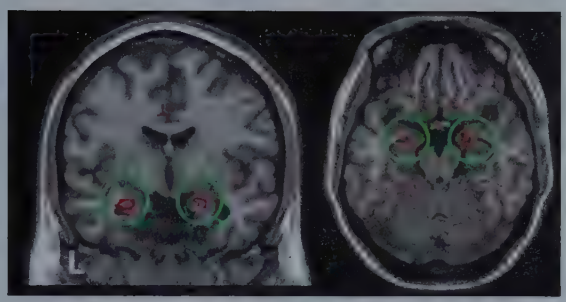
■ **positron emission tomography (PET scan)** An invasive imaging technique that provides color-coded images of brain activity by tracking the brain's use of a radioactively tagged compound, such as glucose, oxygen, or a drug.

■ **magnetic resonance imaging (MRI)** A noninvasive imaging technique that produces highly detailed images of the body's structures and tissues, using electromagnetic signals generated by the body in response to magnetic fields.

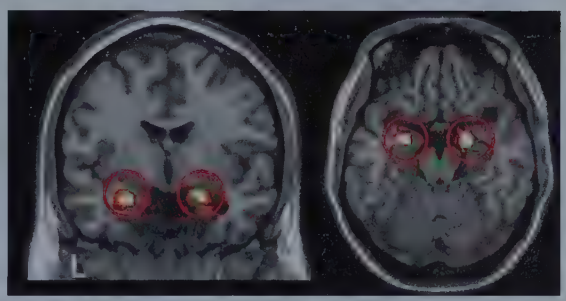


Hippocampus, Vol. 16, 2006, p. 1097. Reprinted with permission of Wiley-Liss, Inc., a subsidiary of John Wiley & Sons, Inc.

Magnetic Resonance Imaging (MRI) MRI scans can produce a highly detailed image of the brain, showing "slices" of the brain from different angles. The yellow dots highlight the brain region that was significantly larger in experienced London taxi drivers, known for their encyclopedic memory of London streets, as compared to control subjects (Maguire & others, 2000, 2006). This region, called the *hippocampus*, is known to be involved in forming new memories. This landmark study provided solid evidence for the once revolutionary idea that structures in the adult brain change in response to experience and learning.



Sleep Rested



Sleep Deprived

Reprinted from Current Biology, Vol. 17, Ryu Soojin, Mahler Julia, Acampora Dario, Holzschuh Jochen, Erhardt Simone, Omodei Daniela, Simeone Antonio and Driever Wolfgang, Orthopedia Homeodomain Protein Is Essential for Diencephalic Dopaminergic Neuron Development, p. 8. With permission from Elsevier.

Functional Magnetic Resonance Imaging (fMRI) fMRI combines highly detailed images of brain structures with moment-by-moment tracking of brain activity. In this experiment, fMRI was used to compare emotional responses to disturbing visual images in two groups of participants: participants who had had a normal night's sleep and sleep-deprived participants who had been awake for 35 hours (Yoo & others, 2007). The circled brain region, called the *amygdala*, is known to be involved in emotion. The scans revealed that the amygdala was much more active in sleep-deprived subjects (circled in red) than in participants who were not sleep-deprived (circled in green).

1. *Brain-imaging studies usually involve a small number of subjects.* Because of the limited availability and the high cost of the technology, many brain-imaging studies have fewer than a dozen participants. With any research involving a small number of participants, caution must be exercised in generalizing results to a wider population (Lieberman & Cunningham, 2009).
2. *Brain-imaging studies tend to focus on simple aspects of behavior.* Even seemingly simple tasks involve the smooth coordination of multiple brain regions. As Jerome Kagan (2008) observes, "An event as simple as the unexpected sound of a whistle activates 24 different brain areas." Thus, it's naïve to think that complex psychological or behavioral functions can be mapped to a single brain center.
3. *Brain imaging may not increase understanding of a psychological process.* For example, although brain imaging might point to a particular brain structure as being involved in, say, fear or romantic love, knowing this may not advance our understanding of the psychological experience of fear or romantic love (Decety & Cacioppo, 2010)
4. *Brain imaging is not necessarily a more "scientific" explanation.* As psychologist Paul Bloom (2006) points out, "Functional MRI seems more like 'real' science than many of the other things that psychologists are up to. It has all the trappings of work with great laboratory credibility: big, expensive, and potentially dangerous machines, hospitals and medical centers, and a lot of people in white coats." To be truly useful, brain activity snapshots of a particular behavior must be accurately interpreted within the context of existing psychological knowledge about the behavior (Beck, 2010)

Looking at Brain-Scan Images

What should you notice when you look at the brain-scan images in this text? First, read the text description so you understand the task or condition being measured. Second, read the brain scan-caption for specific details or areas to notice. Third, carefully compare the treatment scan with the control scan if both are shown. Fourth, keep the limitations of brain-scan technology in mind. Finally, remember that human experience is much too complex to be captured by a single snapshot of brain activity (Miller, 2010; Vul & others, 2009).

■ **functional magnetic resonance imaging (fMRI)** A noninvasive imaging technique that uses magnetic fields to map brain activity by measuring changes in the brain's blood flow and oxygen levels.

Ethics in Psychological Research

KEY THEME

› Psychological research conducted in the United States is subject to ethical guidelines developed by the American Psychological Association (APA).

KEY QUESTIONS

› What are five key provisions of the APA ethics code for research involving humans?

› Why do psychologists sometimes conduct research with nonhuman animals?



From the film Obedience, distributed by the New York University Film Library

The Shocking Treatment of Research Participants? Could a psychologist ethically conduct an experiment in which research participants were instructed to shock another person for incorrect answers on a memory test? This photo is taken from an actual psychology experiment conducted by Stanley Milgram in the early 1960s. To find out more, stay tuned: we discuss Milgram's research in detail in Chapter 13, Social Psychology. Today's psychologists are required to follow stringent ethical guidelines developed by the American Psychological Association.

What might happen if you were to volunteer to participate in a psychology experiment or study? Are psychologists allowed to manipulate or control you without your knowledge or consent? Could a psychologist force you to reveal your innermost secrets? Could he or she administer electric shocks?

The answer to all these questions is "no." The American Psychological Association (APA) has developed a strict code of ethics for conducting research with both human and animal subjects. This code is contained in a document called *Ethical Principles of Psychologists and Code of Conduct* (APA, 2002, 2010). At the Web site www.apa.org/ethics, you can download a copy of the document.

In general, psychologists must respect the dignity and welfare of participants. Psychologists cannot deceptively expose research participants to dangerous or harmful conditions that might cause either physical or emotional harm. At most institutions, any psychological research using human or animal subjects is scrutinized by an institutional review board before approval is granted (Pollick, 2007; Schrag, 2010).

Not surprisingly, the ethical guidelines for research with human and animal subjects are somewhat different. However, the use of animals in psychological research is also governed by specific ethical guidelines (APA, 2011). These guidelines, as well as other issues, are discussed in the In Focus box.

Here are highlights of five key provisions in the most recent APA ethical principles regulating research with human participants:

- **Informed consent and voluntary participation.** The psychologist must inform the participants of the purpose of the research, including significant factors that might influence a person's willingness to participate in the study, such as potential risks, discomfort, or unpleasant emotional experiences. The psychologist must also explain that participants are free to decline to participate or to withdraw from the research at any time.
- **Students as research participants.** When research participation is a course requirement or an opportunity for extra credit, the student must be given the choice of an alternative activity to fulfill the course requirement or earn extra credit.
- **The use of deception.** Psychologists can use deceptive techniques as part of the study only when two conditions have been met: (1) it is not feasible to use alternatives that do not involve deception, and (2) the potential findings justify the use of deception because of their scientific, educational, or applied value.
- **Confidentiality of information.** In their writing, lectures, or other public forums, psychologists may not disclose personally identifiable information about research participants.
- **Information about the study and debriefing.** All participants must be provided with the opportunity to obtain information about the nature, results, and conclusions of the research. Psychologists are also obligated to *debrief* the participants and to correct any misconceptions that participants may have had about the research.

comparative psychology Branch of psychology that studies the behavior or different animal species.

IN FOCUS

Questions About the Use of Animals in Psychological Research

The use of nonhuman animal subjects in psychological and other research is based on the premise that human life is intrinsically more valuable than animal life. Not everyone agrees with this position (Knight & Herzog, 2009; Miller, 2011).

The American Psychological Association (2011) condones the use of animals in psychological research under certain conditions. First, research using animal subjects must have an acceptable scientific purpose. Second, there must be a reasonable expectation that the research will (a) increase knowledge about behavior, (b) increase understanding of the species under study, or (c) produce results that benefit the health or welfare of humans or other animals.

What standards must psychologists meet in using animal subjects?

The American Psychological Association publishes the *Guidelines for Ethical Conduct in the Care and Use of Animals*, which you can read at: http://www.apa.org/science/leadership/care/guidelines.aspx. The APA guidelines for animal care have been praised as being the most comprehensive set of guidelines of their kind. In addition, psychologists must adhere to federal and state laws governing the use and care of research animals (Garnett, 2005).

How common is the use of animal subjects in psychology research?

Contrary to what many people in the general public believe, the majority of psychology research involves human subjects, not animals. In fact, more than 90 percent of psychology research uses human participants as the subjects. Nonhuman animals are used in only about 7 to 8 percent of psychological studies conducted in a given year. About 90 percent of the animals used in psychological research are rodents and birds, primarily rats, mice, and pigeons. Only about 5 percent of the animals are monkeys and other primates. Use of dogs or cats is rare in psychological studies. The rest of the total includes a wide variety of creatures, from bats to sea snails (APA Committee on Animal Research and Ethics, 2008).

Why are animals used in psychological research?

Here are a few of the key reasons that psychologists might use animal subjects rather than human subjects in research:

1. Many psychologists are interested in the study of animal behavior for its own sake.

The branch of psychology that focuses on the study of the behavior of nonhuman animals is called **comparative psychology.** Some psychologists also do research in *animal cognition,* which is the study of animal learning, memory, thinking, and language (Wasserman & Zentall, 2006).

Animal research is also pursued for its potential benefit to animals themselves. For example, psychological research on animal behavior has been used to improve the quality of life of animals in zoos and to increase the likelihood of survival of endangered species in the wild (Blumstein & Fernandez-Juricic, 2010; Goulart & others, 2009).

2. Animal subjects are sometimes used for research that could not feasibly be conducted on human subjects.

There are many similarities between human and animal behavior, but animal behavior tends to be less complex. Thus, it is sometimes easier to identify basic principles of behavior by studying animals. Psychologists can also observe some animals throughout their entire lifespan. To track such changes in humans would take decades of research. Finally, psychologists can exercise greater control over animal subjects than over human subjects. If necessary, researchers can control every aspect of the animals' environment and even their genetic background (Ator, 2005).

In what areas of psychology has research using animals produced valuable information?

Psychological research with animal subjects has made essential contributions to virtually every area of psychology. Animal research has contributed to psychological knowledge in the areas of neuroscience, learning, memory, cognition, motivation, psychological disorders, therapies, and stress. Research with animals has produced significant gains in the treatment of many conditions, including substance abuse, spinal cord injury, hypertension, and sleep disorders (see Carroll & Overmier, 2001). Significant gains have also been made in helping animals, including the successful breeding and preservation of endangered species, improvements in the care of zoo animals, and the prevention of animal diseases (Blumstein & Fernandez-Juricic, 2010; Goulart & others, 2009).



Courtesy of Zoo Atlanta

Comparative psychologist Rebecca Snyder is the curator of giant panda research and management at Zoo Atlanta. Collaborating with scientists at Chengdu Zoo in Sichuan province in China, Snyder and her colleagues have studied topics as diverse as spatial memory in adult giant pandas, play behavior in cubs, and reproductive behavior (Charlton & others, 2010; Perdue & others, 2009; Wilson & others, 2009). Knowledge gained from such research not only improves the quality of life of pandas in zoos, but also can be applied to conservation efforts in the wild (Maple, 2007, 2006). Many zoos consult comparative psychologists to help design appropriate housing and enrichment activities for all sorts of animals. For more on the giant panda psychological and behavioral research at Zoo Atlanta, visit: www.zooatlanta.org/conservation_giant_panda_research.htm

CLOSING THOUGHTS

So what happened to Brenda's son, Adam, whose therapist had recommended the use of a magnetic vest and mattress? As it turned out, the magnetic vest produced no beneficial effects, let alone "miracles." Rather than purchase a magnetic mattress, Brenda and her husband took their son to a clinical psychologist who worked at a medical school. A team of specialists that included two clinical psychologists conducted a new diagnostic evaluation of Adam.

The results? Adam did *not* have schizophrenia. He had *Asperger's syndrome*, a developmental disorder that resembles autism. Although people with Asperger's syndrome usually have normal or above-normal intelligence, they also have poor social skills. Other common features of Asperger's syndrome are inappropriate emotional responses, repetitive behaviors or rituals, and odd or peculiar behaviors. You'll read more about Asperger's syndrome in Chapter 7.

Today, Adam is a senior in high school and his future is much brighter. Brenda's entire family has gone through social skills training to help Adam learn how to interact more successfully with others.

Like Brenda, many of our students come to psychology with questions about personal experiences, seeking explanations for both normal and unusual behaviors. As you'll see in the coming chapters, psychological research has produced many insights into behavior and mental processes. We look forward to sharing those insights with you.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Psychology in the Media: Becoming an Informed Consumer

Psychologists and psychological findings are often featured in the media. Sometimes it's a researcher who is being interviewed about an interesting new study. Or a psychologist may appear on a talk show to discuss the research on a particular topic, such as whether violent video games influence aggressiveness.

How can you evaluate information about psychological topics reported in the mass media? The following guidelines can help.

1. *Anecdotes are the essence of talk shows, not scientific evidence.*

Psychology-related topics are standard fare on news and talk shows and even the so-called reality TV shows. Although such programs often feature psychologists with research experience and expertise in a particular area, the shows tend to abandon discussions of scientific evidence in favor of anecdotal evidence.

Anecdotal evidence consists of personal stories told to confirm or support a particular claim. The personal stories are often dramatic, funny, or heartrending, making them subjectively interesting and compelling. But as we noted in the chapter, anecdotes are not scientific evidence. By definition, an anecdote is one person's subjective experience told from his or her perspective. There's no way to know if the person's experience is representative of the experiences of other people—or if it is exceptional or unusual. There's also no way to determine the story's truthfulness or accuracy. In Chapter 6, on memory, you'll learn about factors that can easily distort the accuracy of a person's memories.

2. *Dramatic or sensational headlines are "hooks."*

Alia Crum and Ellen Langer's (2007) findings in the hotel experiment were reported in the media with headlines like this: "You Don't Have to Exercise, Just Think You Do" and "Can Your Mind Control Your Weight and Blood Pressure?" (Brain, 2008). Headlines are designed to grab your attention. But if you listen or read further, you'll usually encounter much more cautious statements by the psychologists themselves. As scientists, psychologists tend to be conservative in explaining their research results so as not to exaggerate the findings. Reporters, however, are sometimes more interested in attracting readers or viewers than in accurately portraying scientific results (Baron-Cohen, 2009).

As neuroscientist Diane Beck (2010) writes, "The press often presents the latest news in health as a breakthrough or as incontrovertible truth. This, after all, is what sells newspapers. But those of us in science know that breakthroughs are actually very rare; that all results require interpretation; and that scientific knowledge is actually built up very slowly over time, with path corrections along the way."



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"I just feel fortunate to live in a world with so much disinformation at my fingertips."

Given the difficulty of compressing complicated information into a 10-second sound bite, it's common for researchers to be quoted out of context or for important qualifying statements to be left out by a reporter or producer (Farberman, 2003). A 60-minute interview may be edited down to just 20 seconds of air time.

3. *Read the actual summary of the study.*

Psychological research is usually published in a professional psychology journal before it is shared with the general public. For example, it was only *after* Crum and Langer (2007) published their study in the journal *Psychological Science* that they discussed their findings with reporters. If a media report notes the original source of professional publication, you can usually find the study's abstract on the Internet. The *abstract* is a concise summary of the research and its findings. PubMed, at *www.pubmed.gov*, is one excellent source for reading abstracts. Google Scholar, at *scholar.google.com*, is another good source. To try it, go to PubMed and type in the researcher's last name or names (e.g., Crum Langer) and a couple of key words from the study (e.g., exercise hotel). In the list that opens, you should find the study you're looking for in the first few results.

4. *Evaluate the design of the study.*

Media reports of psychological research usually describe how the study was actually carried out. Look for the elements of good scientific research that we discussed in this chapter, such as operational definitions of variables, random samples, experimental control groups, and so forth.

5. *Distinguish between correlation and causality.*

Remember the correlation we mentioned earlier in the photo caption about the relationship between a preference for jazz and higher levels of sexual activity? As a general rule, when the words *link*, *tie*, *connection*, *association*, or *relationship* are used in the media to describe psychological findings, the research being described is correlational.

Correlational studies are often reported in the mass media with the implication that a cause-and-effect relationship exists. But from our earlier discussion, you understand that even though two factors may be strongly correlated, it is entirely possible that one factor does not actually cause change in the other factor. Instead, a third factor might be responsible for the changes reported. Only the experimental method can provide evidence of a causal relationship between two factors.

6. *Embrace an attitude of healthy scientific skepticism.*

Basic human nature sometimes leads us to look for easy answers to life's dilemmas, whether that involves increasing your motivation and self-discipline, improving your memory, combating stress, or enhancing relationships. As you'll see in the Enhancing Well-Being with Psychology sections at the end of each chapter, psychological research has much to say about these and other practical topics. But achieving these goals is rarely as easy as the popular press portrays it. Although you should always keep your mind open to new possibilities, you must carefully consider the evidence. Therefore, when evaluating research claims reported in the media, remember one final axiom: If it sounds too good to be true, it probably is!

> The disconnect between the goals of the press and the result of the scientific process leads to often contradictory headlines, where coffee consumption, for example, is good for you one week and bad for you the next. Without an understanding of the scientific process, it can appear to the public that the facts keep changing. The public's reaction to this apparent inconsistency is not to assume that the press has mischaracterized the results or that this is the natural back and forth of the scientific process. Instead, they conclude that the supposed experts simply do not know what they are doing. Such distrust of science is not particularly damaging to society when it comes to things such as coffee consumption, but it can be when the people decide not to vaccinate their children against measles, mumps, and rubella because of unfounded fears that persist in the media despite scientific evidence to the contrary.
>
> *Diane N. Beck (2010)*



CHAPTER REVIEW

Introduction and Research Methods

KEY POINTS

Introduction: The Origins of Psychology

- Since it was first founded as a science, the definition of psychology has evolved. Today, **psychology** is defined as the scientific study of behavior and mental processes.
- Early philosophers, such as Aristotle and Descartes, used logic and intuition to understand psychological topics. Later, the discoveries of physiologists demonstrated that scientific methods could be applied to psychological topics.
- Wilhelm Wundt, a German physiologist, is credited with founding psychology as an experimental science in 1879. Wundt's student, Edward B. Titchener, established **structuralism,** the first school of psychology. The structuralists used introspection to try to identify the structures of conscious experiences.
- William James founded and promoted psychology in the United States. James established **functionalism,** a school of psychology that emphasized the adaptive role of behavior. James's students, G. Stanley Hall and Mary Whiton Calkins, were two important figures in early American psychology. Margaret Floy Washburn was the first woman and Francis C. Sumner was the first African American to be awarded a Ph.D. in psychology.
- Sigmund Freud established **psychoanalysis** as a theory of personality and form of psychotherapy. Psychoanalysis emphasized the role of unconscious conflicts in determining behavior and personality.
- **Behaviorism** was based on Ivan Pavlov's research and emerged in the early 1900s. Behaviorism was first championed by John B. Watson and further developed by B. F. Skinner. Behaviorism rejected the study of mental processes and emphasized the study of observable behavior, especially the principles of learning.
- Carl Rogers and Abraham Maslow promoted **humanistic psychology,** which emphasized psychological growth and the importance of choice in human behavior.

Contemporary Psychology

- Psychology has become progressively more diverse as a science. Topics can be approached from several different perspectives, which include the biological, psychodynamic, behavioral, humanistic, **positive psychology,** cognitive, cross-cultural, and **evolutionary psychology** perspectives.
- Important specialty areas in psychology include biological, clinical, cognitive, counseling, educational, experimental, developmental, forensic, health, industrial/organizational, personality, rehabilitation, social, and sports psychology. **Psychiatry** is a medical specialty. Clinical psychologists and psychiatrists differ in their training and credentials.

The Scientific Method

- The four goals of psychology are to describe, explain, predict, and influence human behavior and mental processes. Psychology is based on **empirical evidence.**
- Psychologists are trained in the **scientific method**, which has four steps: (1) generate a hypothesis that can be tested empirically, (2) design the study and collect the data, (3) analyze the data and draw conclusions, and (4) report the findings. **Variables** must be **operationally defined.**
- Research methods include descriptive and experimental methods. **Statistics** are used to analyze the data and to determine whether findings are **statistically significant. Meta-analysis** can be used to combine and analyze data from multiple studies on a single topic. Reporting the results of a study allows other researchers to **replicate** the study.
- As research findings accumulate from individual studies, **theories** or models develop to explain the different findings on a related topic. Theories are tools for understanding and explaining behavior and mental processes. Theories can evolve and change as new evidence emerges.

Descriptive Research Methods

- **Descriptive research methods** are used to observe and describe behavior. **Naturalistic observation** is used to detect behavior patterns as they exist in their natural settings. A **case study** involves intensive study of a single subject or a small group of subjects.
- **Surveys,** questionnaires, and interviews are administered to a **sample** of the larger group to be investigated. For results to be generalizable to the larger population, the sample must be a **representative** sample. Participants are usually chosen through **random selection.**
- **Correlational studies** investigate how strongly two factors are related to each other. The relationship is expressed in terms of a **correlation coefficient.** A **positive correlation** indicates that two factors vary in the same direction, whereas a **negative correlation** indicates that two factors vary in opposite directions.
- Even when two factors are strongly related, conclusions cannot be drawn about causality because a third factor may actually be responsible for the association. However, correlational evidence can be used to identify important relationships and to make meaningful predictions.

The Experimental Method

- The **experimental method** can demonstrate a cause-and-effect relationship between one variable and another. An experiment involves manipulating the **independent variable,** then measuring what changes occur in the **dependent variable.** Researchers strive to anticipate and control for the unwanted influences of **extraneous variables.**
- An experiment testing if ginkgo biloba improves memory and other mental abilities illustrated **random assignment** of the participants to the **experimental group** or a **control group** that received a **placebo.** In experiments testing the therapeutic effectiveness of a treatment or procedure, it is important to determine if **placebo effect** or **practice effect** contributed to the observed changes. The ginkgo experiment also showed how using the **double-blind technique** helps guard against the influence of inadvertent **demand characteristics.**
- The hotel maid experiment illustrated the ingenuity involved in designing experiments conducted in everyday settings. It also demonstrated that a person's beliefs and expectations can exert a significant influence on physical health and well-being.
- Not all questions can be studied experimentally. Experiments are sometimes criticized for using artificial laboratory conditions. Although not a true experiment, a **natural experiment** can measure the impact of a naturally occurring event on subjects.
- Brain-imaging technology is used in some descriptive studies and experiments. **PET scans** and **fMRI scans** reveal which brain areas are active during a task. **MRI scans** produce detailed images of the brain's structures. Limitations of brain-imaging research include focusing on simple behaviors and small numbers of participants.

Ethics in Psychological Research

- All psychological research is subject to regulations contained in an ethical code developed by the American Psychological Association. For research with human subjects, the ethical code requires informed consent and voluntary participation. Student participants must be given alternatives to participating in research. Deceptive techniques can be used only under specific conditions. Records are kept confidential, and participants are to be debriefed and allowed to learn more about the study.
- **Comparative psychology** studies the behavior of different animal species. Research with animal subjects is governed by an ethical code developed by the American Psychological Association as well as state and federal regulations.

KEY TERMS

psychology, p. 3
structuralism, p. 4
functionalism, p. 5
psychoanalysis, p. 7
behaviorism, p. 8
humanistic psychology, p. 9
neuroscience, p. 10
positive psychology, p. 11
evolutionary psychology, p 12
culture, p. 13
cross-cultural psychology, p. 13
ethnocentrism, p. 13
individualistic cultures, p. 13
collectivistic cultures, p. 13
psychiatry, p. 16
scientific method, p. 17
empirical evidence, p. 17
hypothesis, p. 17
critical thinking, p. 18
variable, p. 18
operational definition, p. 18
statistics, p. 19
statistically significant, p. 19
meta-analysis, p. 20
replicate, p. 20
theory, p. 21
descriptive research methods, p. 21
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pseudoscience, p. 22
case study, p. 23
survey, p. 24
sample, p. 24
representative sample, p. 24
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correlation coefficient, p. 25
positive correlation, p. 26
negative correlation, p. 26
experimental method, p. 27
independent variable, p. 27
dependent variable, p. 27
extraneous variable, p. 27
experimental group (experimental condition), p. 28
placebo, p. 28
placebo effect, p. 28
random assignment, p. 28
double-blind technique, p. 28
demand characteristics, p. 29
practice effect, p. 29
main effect, p. 29
control group (control condition), p. 30
natural experiment, p. 32
positron emission tomography (PET scan), p. 34
magnetic resonance imaging (MRI), p. 34
functional magnetic resonance imaging (fMRI), p. 34
comparative psychology, p. 37

KEY PEOPLE

Mary Whiton Calkins (1863–1930) American psychologist who conducted research on memory, personality, and dreams; established one of the first U.S. psychology research laboratories; first woman president of the American Psychological Association. (p. 6)

Charles Darwin (1809–1882) English naturalist and scientist whose theory of evolution through natural selection was first published in *On the Origin of Species* in 1859. (p. 5)

Sigmund Freud (1856–1939) Austrian physician and founder of psychoanalysis. (p. 7)

G. Stanley Hall (1844–1924) American psychologist who established the first psychology research laboratory in the United States; founded the American Psychological Association. (p. 6)

William James (1842–1910) American philosopher and psychologist who founded psychology in the United States and established the psychological school called functionalism. (p. 5)

Abraham Maslow (1908–1970) American humanistic psychologist who developed a theory of motivation. (p. 9)

Ivan Pavlov (1849–1936) Russian physiologist whose pioneering research on learning contributed to the development of behaviorism; discovered the basic learning process that is now called classical conditioning, discussed in Chapter 5. (p. 8)

Carl Rogers (1902–1987) American psychologist who founded the school of humanistic psychology. (p. 9)

B. F. Skinner (1904–1990) American psychologist and leading proponent of behaviorism; developed a model of learning called operant conditioning, discussed in Chapter 5; emphasized studying the relationship between environmental factors and observable behavior. (p. 8)

Francis C. Sumner (1895–1954) American psychologist who was the first African American to receive a doctorate in psychology in the United States; chaired Howard University psychology department. (p. 6)

Edward B. Titchener (1867–1927) British-born American psychologist who founded structuralism, the first school of psychology. (p. 4)

Margaret Floy Washburn (1871–1939) American psychologist who was the first woman to earn a doctorate in psychology in the United States; published research on mental processes in animals. (p. 6)

John B. Watson (1878–1958) American psychologist who founded behaviorism, emphasizing the study of observable behavior and rejecting the study of mental processes. (p. 8)

Wilhelm Wundt (1832–1920) German physiologist who founded psychology as a formal science; opened first psychology research laboratory in 1879. (p. 4)

CONCEPT REVIEW ANSWERS

1.1 page 9

1. functionalism; William James
2. humanistic psychology; Carl Rogers
3. structuralism; Edward Titchener
4. psychoanalysis; Sigmund Freud
5. behaviorism; John Watson

1.2 page 16

1. biological perspective; developmental psychology
2. cross-cultural perspective; cognitive psychology
3. behavioral perspective; health psychology
4. psychodynamic perspective; clinical psychology
5. evolutionary perspective; social psychology
6. positive psychology perspective; counseling psychology or developmental psychology

1.3 page 27

1. positive correlation
2. naturalistic observation
3. correlational research
4. negative correlation
5. the case study method

1.4 page 33

1. b 2. h 3. i 4. a 5. e 6. g 7. f 8. d 9. c

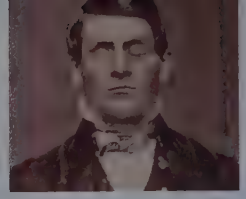


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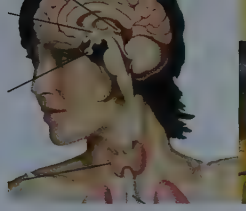


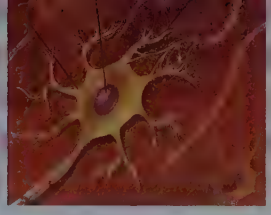


CHAPTER 2

Neuroscience and Behavior







Asha's Story

PROLOGUE

THE HEADACHES BEGAN WITHOUT WARNING. A pounding, intense pain just over Asha's left temple. Asha just couldn't seem to shake it—the pain was unrelenting. She was uncharacteristically tired, too.

But our friend Asha, a 32-year-old university professor, chalked up her constant headache and fatigue to stress and exhaustion. After all, the end of her demanding first semester of teaching and research was drawing near. Still, Asha had always been very healthy and usually tolerated stress well. She didn't drink or smoke. And no matter how late she stayed up working on her lectures and research proposals, she still got up at 5:30 every morning to work out at the university gym.

There were other, more subtle signs that something was wrong. Asha's husband, Paul, noticed that she had been behaving rather oddly in recent weeks. For example, at Thanksgiving dinner, Asha had picked up a knife by the wrong end and tried to cut her turkey with the handle instead of the blade. A few hours later, Asha had made the same mistake trying to use scissors: She held the blades and tried to cut with the handle.

Asha laughed these incidents off, and for that matter, so did Paul. They both thought she was simply under too much stress. And when Asha occasionally got her words mixed up, neither Paul nor anyone else was terribly surprised. Asha was born in India, and her first language was Tulu. Although Asha was extremely fluent in English, she often got English phrases slightly wrong—like the time she said that Paul was a "straight dart" instead of a "straight arrow." Or when she said that it was "storming cats and birds" instead of "raining cats and dogs."

There were other odd lapses in language. "I would say something, thinking it was correct," Asha recalled, "and people would say to me, 'What are you saying?' I wouldn't realize I was saying something wrong. I would open my mouth and just nonsense would come out. But it made perfect sense to me. At other times, the word was on the tip of my tongue—I knew I knew the word, but I couldn't find it. I would fumble for the word, but it would come out wrong. Sometimes I would slur words, like I'd try to say 'Saturday,' only it would come out 'salad-day.'"

On Christmas morning, Paul and Asha were with Paul's family, opening presents. Asha walked over to Paul's father to look at the pool cue he had received as a gift. As she bent down, she fell forward onto her father-in-law. At first, everyone thought Asha was just joking around. But then she fell to the floor, her body stiff. Seconds later, it was apparent that Asha had lost consciousness and was having a seizure.

Asha remembers nothing of the seizure or of being taken by ambulance to the hospital intensive care unit. She floated in and out of consciousness for

IN THIS CHAPTER:

- Introduction: Neuroscience and Behavior
- The Neuron: The Basic Unit of Communication
- The Nervous System and the Endocrine System: Communication Throughout the Body
- A Guided Tour of the Brain
- Specialization in the Cerebral Hemispheres
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Maximizing Your Brain's Potential

the first day and night. A CAT scan showed some sort of blockage in Asha's brain. An MRI scan revealed a large white spot on the left side of her brain. At only 32 years of age, Asha had suffered a stroke—brain damage caused by a disruption of the blood flow to the brain.

She remained in the hospital for 12 days. It was only after Asha was transferred out of intensive care that both she and Paul began to realize just how serious the repercussions of the stroke were. Asha couldn't read or write and had difficulty comprehending what was being said. Although she could speak, she could not name even simple objects, such as a tree, a clock, or her doctor's tie. In this chapter, you will discover why the damage to Asha's brain impaired her ability to perform simple behaviors, like naming common objects.



Introduction: Neuroscience and Behavior

biological psychology Specialized branch of psychology that studies the relationship between behavior and bodily processes and systems; also called *biopsychology* or *psychobiology*.

neuroscience The study of the nervous system, especially the brain.

As we discussed in Chapter 1, **biological psychology** is the scientific study of the biological bases of behavior and mental processes. Biological psychology is one of the scientific disciplines that make important contributions to **neuroscience**—the scientific study of the nervous system. Other scientific disciplines that contribute to neuroscience include biology, physiology, genetics, and neurology.

Neuroscience and biological psychology are not limited to the study of the brain and the nervous system. Throughout this textbook, you'll notice the many questions that have been studied by neuroscientists. Here are some examples:

- How do you tell the difference between red and blue, sweet and sour, loud and soft? (Chapter 3)
- What happens in the brain when you sleep, dream, or meditate? (Chapter 4)
- What exactly is a memory, and how are memories stored in the brain? (Chapter 6)
- Why do you get hungry? How do emotions occur? (Chapter 8)
- How do emotions and personality factors affect your vulnerability to infection and disease? (Chapter 13)
- How does heredity influence your development? What role does genetics play in personality traits and psychological disorders? (Chapters 9, 11, and 14)
- What role does abnormal brain chemistry play in psychological disorders? How do medications alleviate the symptoms of serious psychological disorders? (Chapters 14 and 15)

This chapter will lay an important foundation for the rest of this book by helping you develop a broad appreciation of the *nervous system*—the body's primary communication network. We'll start by looking at *neurons,* the basic cells of the nervous system. We'll consider the organization of the nervous system and a closely linked communication network, the *endocrine system.* We'll then move on to a guided tour of the brain. We'll look at how certain brain areas are specialized to handle different functions, such as language, vision, and touch. In Enhancing Well-Being with Psychology, at the end of the chapter, we'll describe how the brain responds to environmental stimulation by literally altering its physical structure. And we'll return to Asha's story and tell you how she fared after her stroke.

Masterfile



Neuroscience and Behavior Laughing and talking as you and a friend simultaneously ride your bikes and scan the path for obstacles—even seemingly simple behaviors involve the harmonious integration of multiple internal signals and body processes. What kinds of questions might neuroscientists ask about the common behaviors shown here?

The Neuron

The Basic Unit of Communication

KEY THEME

› Information in the nervous system is transmitted by specialized cells, called neurons.

KEY QUESTIONS

› What are the basic components of the neuron, and what are their functions?

› What are glial cells, and what is their role in the nervous system?

› What is an action potential, and how is it produced?

Communication throughout the nervous system takes place via **neurons**—cells that are highly specialized to receive and transmit information from one part of the body to another. Most neurons, especially those in your brain, are extremely small. A bit of brain tissue no larger than a grain of rice contains about 10,000 neurons! Your entire brain contains an estimated 100 *billion* neurons.

Neurons vary greatly in size and shape, reflecting their specialized functions (see Figure 2.1). There are three basic types of neurons, each communicating different kinds of information. **Sensory neurons** convey information about the environment, such as light or sound, from specialized receptor cells in the sense organs to the brain. Sensory neurons also carry information from the skin and internal organs to the brain. **Motor neurons** communicate information to the muscles and glands of the body. Simply blinking your eyes activates thousands of motor neurons. Finally, **interneurons** communicate information *between* neurons. By far, most of the neurons in the human nervous system are interneurons. Many interneurons connect to other interneurons.

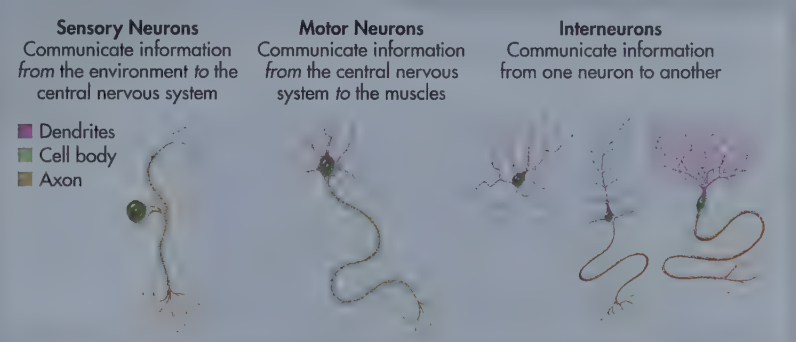


FIGURE 2.1 Types of Neurons There are hundreds of different types of neurons in the human nervous system (Masland, 2004). They differ in size, shape, and complexity. The distinctive shapes of neurons reflect their specialized functions. Shown here are a few representative neuron types, illustrating the variety that exists throughout the human nervous system. Although neurons vary in size and shape, virtually all neurons have three basic parts: a *cell body*, an *axon*, and *dendrites*.

Characteristics of the Neuron

Most neurons have three basic components: a *cell body, dendrites,* and an *axon* (see Figure 2.2 on the next page). The **cell body,** also called the *soma,* contains structures that manufacture proteins and process nutrients, providing the energy the neuron needs to function. The cell body also contains the *nucleus,* which in turn contains the cell's genetic material—twisted strands of DNA called *chromosomes.*

Extending from the cell body are short, branching fibers, called **dendrites.** The term *dendrite* comes from a Greek word meaning "tree." If you have a good imagination, the intricate branching of the dendrites does often resemble the branches of a tree. Dendrites *receive* messages from other neurons or specialized cells. Dendrites with many branches have a greater surface area, which increases the amount of information the neuron can receive. Some neurons have thousands of dendrites.

The **axon** is a single, elongated tube that extends from the cell body in most, though not all, neurons. (Some neurons do not have axons.) Axons carry information *from* the neuron *to* other cells in the body, including other neurons, glands, and muscles. In contrast to the potentially large number of dendrites, a neuron has only one axon exiting from the cell body. However, many axons have branches near their tips that allow the neuron to communicate information to more than one target.

Axons can vary enormously in length. Most axons are very small; some are no more than a few thousandths of an inch long. Other axons are quite long. For

neuron Highly specialized cell that communicates information in electrical and chemical form; a nerve cell.

sensory neuron Type of neuron that conveys information to the brain from specialized receptor cells in sense organs and internal organs.

motor neuron Type of neuron that signals muscles to relax or contract.

interneuron Type of neuron that communicates information from one neuron to the next.

cell body Processes nutrients and provides energy for the neuron to function; contains the cell's nucleus; also called the *soma.*

dendrites Multiple short fibers that extend from the neuron's cell body and receive information from other neurons or from sensory receptor cells.

axon The long, fluid-filled tube that carries a neuron's messages to other body areas.



Dr. Klaus Boller/Photo Researchers

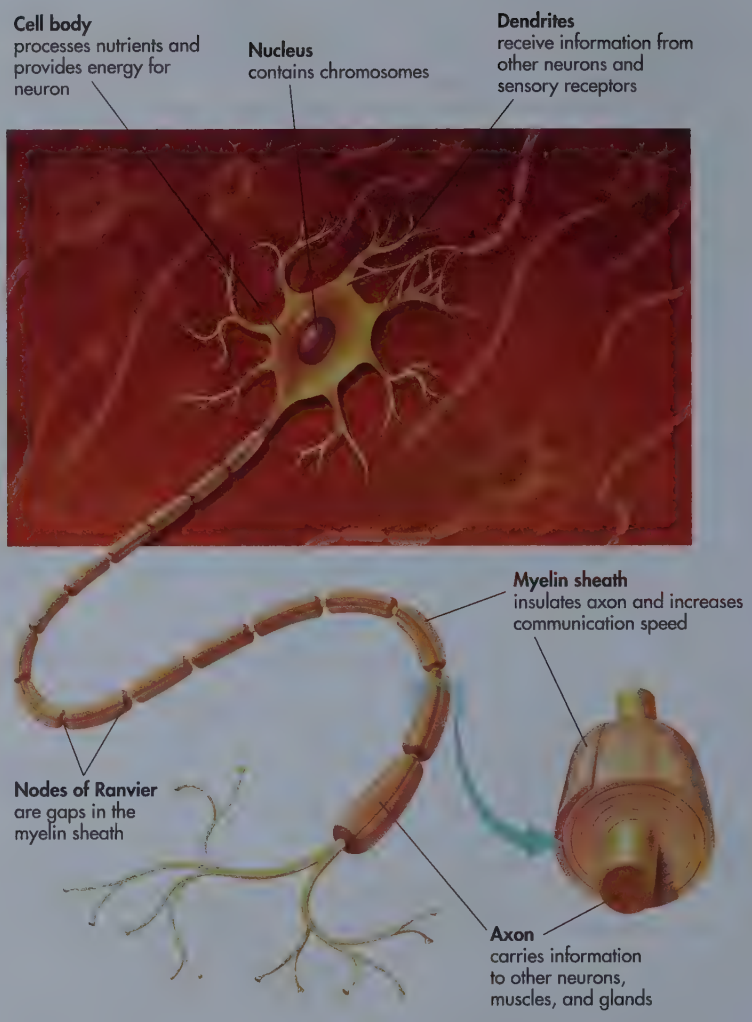


FIGURE 2.2 The Parts of a Typical Neuron The drawing shows the location and function of key parts of a neuron. The photograph, made with the aid of an electron microscope, reveals actual cell bodies, dendrites, and axons in a cluster of neurons. The green coloring was added to provide contrast in the photograph to make the neurons more visible.

example, the longest axon in your body is that of the motor neuron that controls your big toe. This axon extends from the base of your spine into your foot. If you happen to be a seven-foot-tall basketball player, this axon could be four feet long! For most of us, of course, this axon is closer to three feet long.

glial cells, or glia (GLEE-ull) Support cells that assist neurons by providing structural support, nutrition, and removal of cell wastes; manufacture myelin.

myelin sheath (MY-eh-lin) A white, fatty covering wrapped around the axons of some neurons that increases their communication speed.

action potential A brief electrical impulse by which information is transmitted along the axon of a neuron.

stimulus threshold The minimum level of stimulation required to activate a particular neuron.

resting potential State in which a neuron is prepared to activate and communicate its message if it receives sufficient stimulation.

Glial Cells: More Than Just the Brain's Packing Material

Along with neurons, the human nervous system is made up of other specialized cells, called **glial cells** or simply **glia** (see photo on the next page). Glial cells greatly outnumber neurons by about 10 to 1. *Glia* is Greek for "glue," and at one time it was thought that glial cells were the "glue" that held neurons together. Although they don't actually glue neurons together, glia do provide structural support for neurons throughout the nervous system.

Today, neuroscientists know that glia are more than just the brain's packing peanuts (Fields, 2011a, b). There are several different kinds of glial cells, each with its own specialized function (Fields, 2010, 2011a). *Microglia* remove waste products from the nervous system, including dead and damaged neurons (Graeber, 2010). *Astrocytes*, shown in the photo on the next page, are the most abundant cell type in the human brain (Freeman, 2010). They provide connections between neurons and

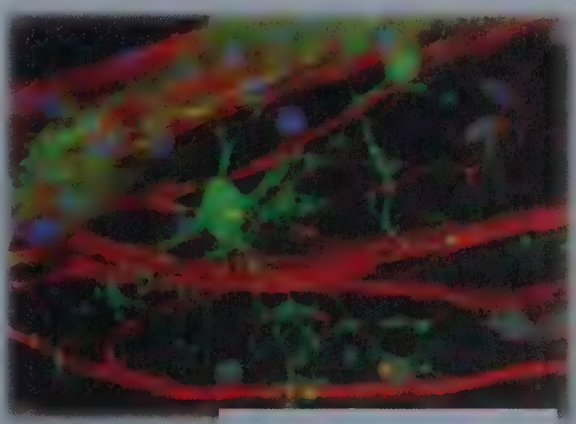
blood vessels, and are also involved in brain development and the communication of information among neurons (Allen & Barres, 2009; Eroglu & Barres, 2010).

Two other types of glial cells, *oligodendrocytes* in the brain and *Schwann cells* in the rest of the nervous system, form the **myelin sheath,** a white fatty covering that is wrapped around the axons of some, but not all, neurons (Nave, 2010). Oligodendrocytes are shown in the photo below. In much the same way that insulating plastic on electrical wires prevents interference when wires contact each other, myelin helps insulate one axon from the axons of other neurons. Rather than forming a continuous coating of the axon, however, the myelin sheath occurs in segments that are separated by small gaps. The small gaps are called the *nodes of Ranvier,* or simply *nodes* (see Figure 2.2). Neurons whose axons are wrapped in myelin communicate their messages up to 100 times faster than do unmyelinated neurons (Nave, 2010).

The importance of myelin becomes readily apparent when it is damaged (Emery, 2010). For example, *multiple sclerosis* is a disease that involves the degeneration of patches of the myelin sheath. This degeneration causes the transmission of neural messages to be slowed or interrupted, resulting in disturbances in sensation and movement. Muscular weakness, loss of coordination, and speech and visual disturbances are some of the symptoms that characterize multiple sclerosis.



Ellisman and Bushong/ National Center for Microscopy and Imaging Research



Reprinted from White Matter Matters, Scientific American, March 2008, courtesy of R. Douglas Fields and Varsha Shukla

Glial Cells: More Than Just the Brain's Packing Material Glial cells, or glia, were once thought of as simply connective tissue supporting neurons. Today, neuroscientists are studying the active role they play in brain functioning (Fields, 2011b). The colored micrograph on the top shows a star-shaped *astrocyte* (green), surrounding a neuron (red). Astrocytes provide connections between neurons and blood vessels in the brain. They are now also known to help regulate communication among neurons (Fields, 2011a; Freeman, 2010).

The colored micrograph on the bottom shows the first stages of myelin formation by an *oligodendrocyte* (green). Like a spider spinning a web, the oligodendrocyte sends tendrils out to neighboring axons (red) and wraps layers of myelin around them in a spiral-shaped pattern (Fields, 2001a; Nave, 2010).

Communication Within the Neuron

The All-or-None Action Potential

Essentially, the function of neurons is to transmit information throughout the nervous system. But exactly *how* do neurons transmit information? What form does this information take? In this section, we'll consider the nature of communication *within* a neuron, and in the following section we'll describe communication between neurons. As you'll see, communication in and *between* neurons is an electrochemical process.

In general, messages are gathered by the dendrites and cell body and then transmitted along the axon in the form of a brief electrical impulse called an **action potential.** The action potential is produced by the movement of electrically charged particles, called *ions,* across the membrane of the axon. Some ions are negatively charged, others positively charged.

Think of the axon membrane as a gatekeeper that carefully controls the balance of positive and negative ions on the interior and exterior of the axon. As the gatekeeper, the axon membrane opens and closes *ion channels* that allow ions to flow into and out of the axon.

Each neuron requires a minimum level of stimulation from other neurons or sensory receptors to activate it. This minimum level of stimulation is called the neuron's **stimulus threshold.** While waiting for sufficient stimulation to activate it, the neuron is said to be *polarized*. This means that there is a difference in the electrical charge between the inside and the outside of the axon.

More specifically, there is a greater concentration of negative proteins inside the neuron. Thus, the axon's interior is more negatively charged than is the exterior fluid surrounding the axon. The negative electrical charge is about –70 millivolts (thousandths of a volt) (see Figure 2.4 on page 49). The –70 millivolts is referred to as the neuron's **resting potential.**

In this polarized, negative-inside/positive-outside condition, there are different concentrations of two particular ions: sodium and potassium. While the neuron is in resting potential, the fluid surrounding the axon contains a larger concentration of

sodium ions than does the fluid within the axon. The fluid within the axon contains a larger concentration of *potassium* ions than is found in the fluid outside the axon.

When sufficiently stimulated by other neurons or sensory receptors, the neuron *depolarizes,* beginning the action potential. At each successive axon segment, sodium ion channels open for a mere thousandth of a second. The sodium ions rush to the axon interior from the surrounding fluid, and then the sodium ion channels close. Less than a thousandth of a second later, the potassium ion channels open, allowing potassium to flow out of the axon and into the fluid surrounding it. Then the potassium ion channels close (see Figure 2.3). This sequence of depolarization and ion movement continues in a self-sustaining fashion down the entire length of the axon.

As this ion exchange occurs, the relative balance of positive and negative ions separated by the axon membrane changes. The electrical charge on the inside of the axon momentarily changes to a positive electrical charge of about +30 millivolts. The result is a brief positive electrical impulse that progressively occurs at each segment down the axon—the *action potential.*

Although it's tempting to think of the action potential as being conducted in much the same way as electricity is conducted through a wire, that's *not* what takes place in the neuron. The axon is actually a poor conductor of electricity. At each successive segment of the axon, the action potential is *regenerated* in the same way in which it was generated in the previous segment—by depolarization and the movement of ions.

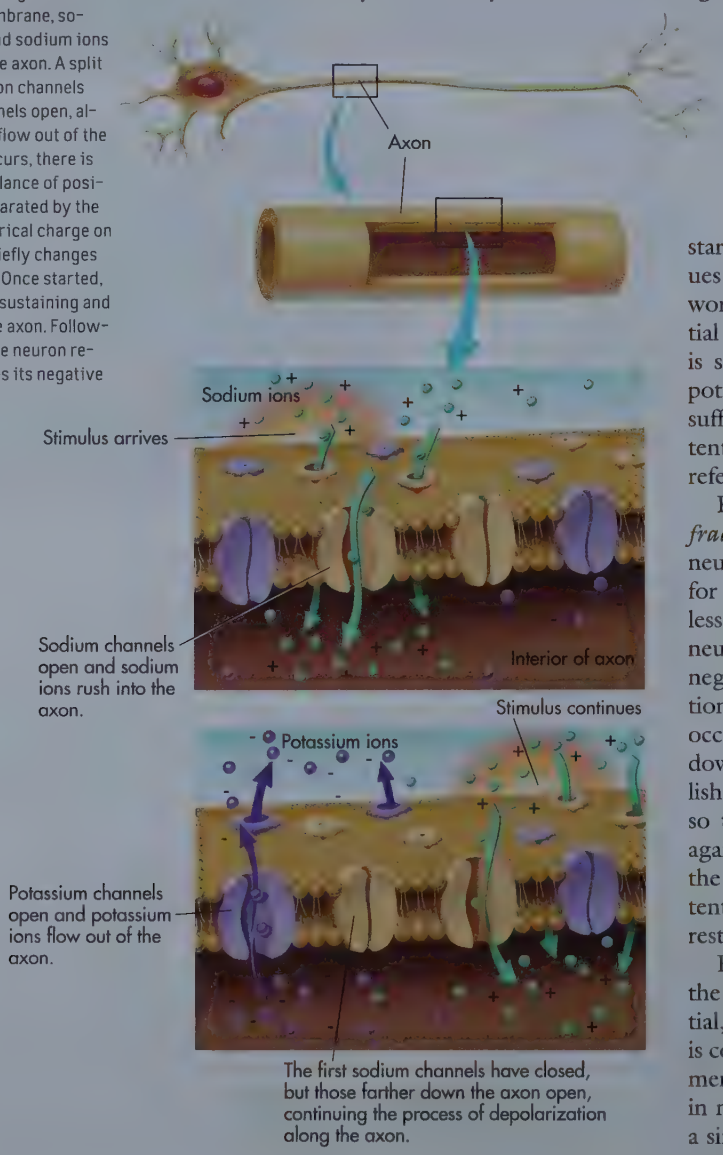


FIGURE 2.3 Communication Within the Neuron: The Action Potential These drawings depict the ion channels in the membrane of a neuron's axon. When sufficiently stimulated, the neuron depolarizes and an action potential begins. At each progressive segment of the axon's membrane, sodium ion channels open and sodium ions rush into the interior of the axon. A split second later, the sodium ion channels close and potassium channels open, allowing potassium ions to flow out of the axon. As this sequence occurs, there is a change in the relative balance of positive and negative ions separated by the axon membrane. The electrical charge on the interior of the axon briefly changes from negative to positive. Once started, an action potential is self-sustaining and continues to the end of the axon. Following the action potential, the neuron repolarizes and reestablishes its negative electrical charge.

Once the action potential is started, it is *self-sustaining* and continues to the end of the axon. In other words, there is no such thing as a partial action potential. Either the neuron is sufficiently stimulated and an action potential occurs, or the neuron is not sufficiently stimulated and an action potential does not occur. This principle is referred to as the **all-or-none law.**

Following the action potential, a *refractory period* occurs during which the neuron is unable to fire. This period lasts for about a thousandth of a second or less. During the refractory period, the neuron *repolarizes* and reestablishes the negative-inside/positive-outside condition. Like depolarization, repolarization occurs progressively at each segment down the axon. This process reestablishes the *resting potential* conditions so that the neuron is capable of firing again. The graph in Figure 2.4 depicts the complete sequence from resting potential to action potential and back to resting potential.

For clarity, we've simplified some of the details involved in the action potential, but this is basically how information is communicated *within* the neuron. Remember, action potentials are generated in mere thousandths of a second. Thus, a single neuron can potentially generate

hundreds of neural impulses per second. Given these minute increments of time, just how fast do neural impulses zip around your body?

The fastest neurons in your body communicate at speeds of up to 270 miles per hour. In the slowest neurons, messages creep along at about 2 miles per hour. This variation in communication speed is due to two factors: the axon diameter and the myelin sheath. The greater the axon's diameter, the faster the axon conducts action potentials. And, as we said earlier, myelinated neurons communicate faster than unmyelinated neurons. In myelinated neurons, the sodium ion channels are concentrated at each of the nodes of Ranvier where the myelin is missing. So, in myelinated neurons the action potential "jumps" from node to node rather than progressing down the entire length of the axon.

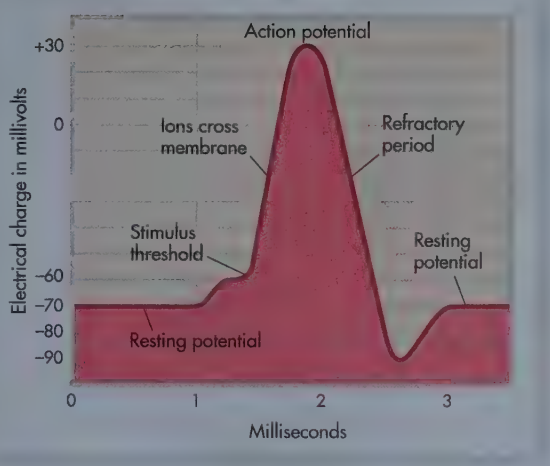


FIGURE 2.4 Electrical Changes During an Action Potential This graph shows the changing electrical charge of the neuron during an action potential. When the neuron depolarizes and ions cross the axon membrane, the result is a brief positive electrical impulse of +30 millivolts—the action potential. During the refractory period, the neuron reestablishes the resting potential negative charge of −70 millivolts and then is ready to activate again.

Communication Between Neurons

Bridging the Gap

KEY THEME

› Communication between neurons takes place at the synapse, the junction between two adjoining neurons.

KEY QUESTIONS

› How is information communicated at the synapse?

› What is a neurotransmitter, and what is its role in synaptic transmission?

› What are five important neurotransmitters, and how do psychoactive drugs affect synaptic transmission?

The primary function of a neuron is to communicate information to other cells, most notably other neurons. The point of communication between two neurons is called the **synapse.** At this communication junction, the message-*sending* neuron is referred to as the *presynaptic neuron.* The message-*receiving* neuron is called the *postsynaptic neuron.* For cells that are specialized to communicate information, neurons have a surprising characteristic: They don't touch each other. The presynaptic and postsynaptic neurons are separated by a tiny, fluid-filled space, called the **synaptic gap,** which is only 20 to 40 nanometers wide. How small is that? For comparison, the thickness of a single sheet of paper is about 100,000 nanometers.

The transmission of information between two neurons occurs in one of two ways: electrically or chemically. When communication is electrical, the synaptic gap is extremely narrow, and special ion channels serve as a bridge between the neurons. Electrical communication between the two neurons is virtually instantaneous. However, less than one percent of the synapses in the brain use electrical transmission.

In general terms, chemical communication occurs when the presynaptic neuron creates a chemical substance that diffuses across the synaptic gap and is detected by the postsynaptic neuron. This one-way communication process between one neuron and another has many important implications for human behavior.

More specifically, here's how chemical communication takes place between neurons. As you've seen, when the presynaptic neuron is activated, it generates an action potential that travels to the end of the axon. At the end of the axon are several small

The Brain Capturing a Thought In the brain, as in the rest of the nervous system, information is transmitted by electrical impulses (red area) that speed from one neuron to the next.



Courtesy Tim Murphy and Gil Wier, The University of British Columbia

all-or-none law The principle that either a neuron is sufficiently stimulated and an action potential occurs or a neuron is not sufficiently stimulated and an action potential does not occur.

synapse (SIN-aps) The point of communication between two neurons.

synaptic gap (sin-AP-tick) The tiny space between the axon terminal of one neuron and the dendrite of an adjoining neuron.

axon terminals Branches at the end of the axon that contain tiny pouches, or sacs, called synaptic vesicles.

synaptic vesicles (sin-AP-tick VESS-ick-ulls) Tiny pouches or sacs in the axon terminals that contain chemicals called neurotransmitters.

neurotransmitters Chemical messengers manufactured by a neuron.

synaptic transmission (sin-AP-tick) The process through which neurotransmitters are released by one neuron, cross the synaptic gap, and affect adjoining neurons.

reuptake The process by which neurotransmitter molecules detach from a postsynaptic neuron and are reabsorbed by a presynaptic neuron so they can be recycled and used again.

branches called **axon terminals.** Floating in the interior fluid of the axon terminals are tiny sacs called **synaptic vesicles** (see Figure 2.5). The synaptic vesicles hold special chemical messengers manufactured by the neuron, called **neurotransmitters.**

When the action potential reaches the axon terminals, some of the synaptic vesicles "dock" on the axon terminal membrane, then release their neurotransmitters into the synaptic gap. These chemical messengers cross the synaptic gap and attach to *receptor sites* on the dendrites and other surfaces of the surrounding neurons. This journey across the synaptic gap is slower than electrical transmission but is still extremely rapid; it takes just a few millionths of a second. The entire process of transmitting information at the synapse is called **synaptic transmission.**

What happens to the neurotransmitter molecules after they've attached to the receptor sites of the postsynaptic neuron? Most often, they detach from the receptor and are reabsorbed by the presynaptic neuron so they can be recycled and used again. This process is called **reuptake.** Reuptake also occurs with many of the neurotransmitters that failed to attach to a receptor and were left floating in the synaptic gap. Neurotransmitter molecules that are not reabsorbed or that remain attached to the receptor site are broken down or destroyed by enzymes. As you'll see in the next section, certain drugs can interfere with both of these processes, prolonging the presence of the neurotransmitter in the synaptic gap.

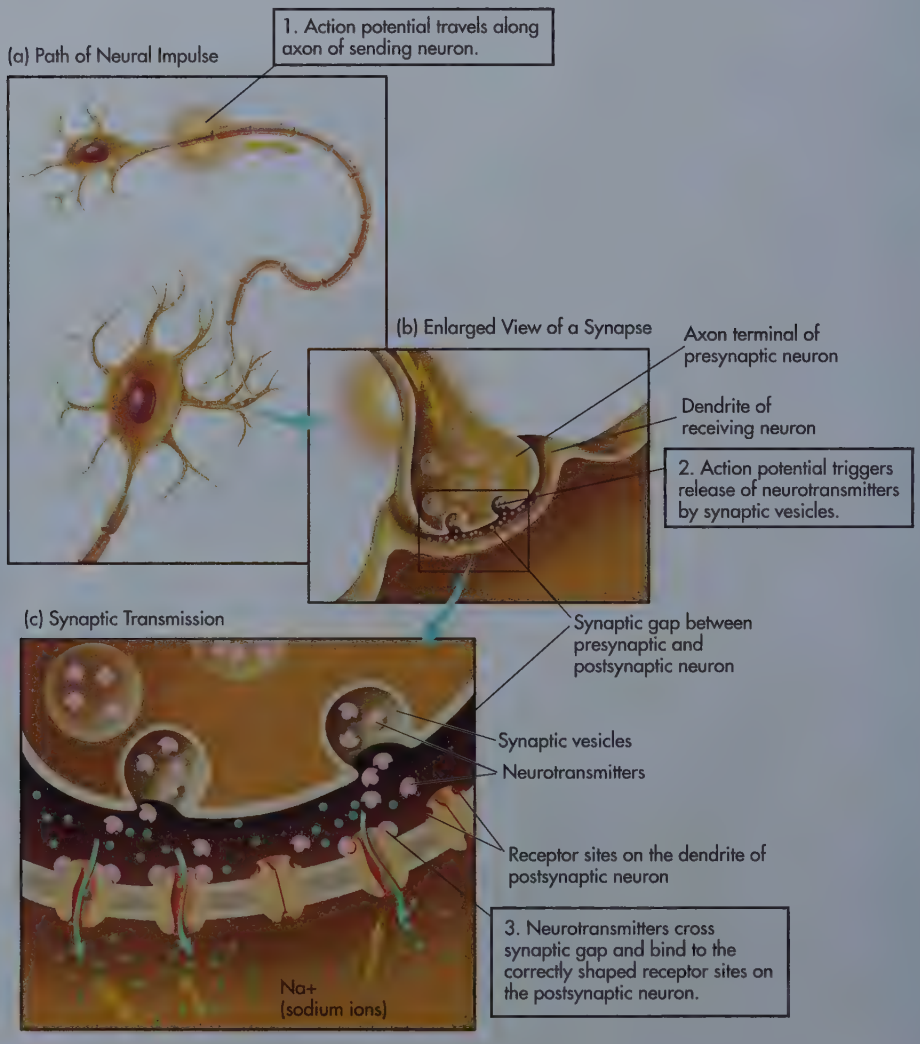


FIGURE 2.5 Communication Between Neurons: The Process of Synaptic Transmission As you follow the steps in this progressive graphic, you can trace the sequence of synaptic transmission in which neurotransmitters are released by the sending, or presynaptic, neuron, cross the tiny fluid-filled space called the synaptic gap, and attach to receptor sites on the receiving, or postsynaptic, neuron.

The number of neurotransmitters that a neuron can manufacture varies. Some neurons produce only one type of neurotransmitter, whereas others manufacture three or more. Scientists have identified more than 100 different compounds that function as neurotransmitters in the brain (Hyman, 2005).

Each type of neurotransmitter has a chemically distinct shape. Like a key in a lock, a neurotransmitter's shape must precisely match that of a receptor site on the postsynaptic neuron for the neurotransmitter to affect that neuron. Keep in mind that the postsynaptic neuron can have many differently shaped receptor sites on its dendrites and other surfaces. Thus, a given neuron may be able to receive several different neurotransmitters. The distinctive shapes of neurotransmitters and their receptor sites are shown schematically in Figure 2.6.

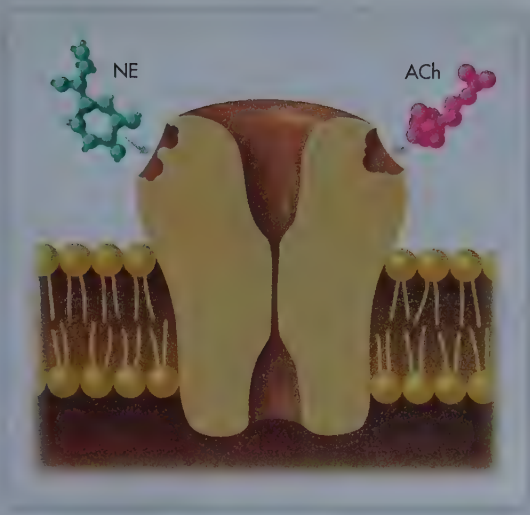


FIGURE 2.6 Neurotransmitter and Receptor Site Shapes Each neurotransmitter has a chemically distinct shape. Like a key in a lock, a neurotransmitter must perfectly fit the receptor site on the receiving neuron for its message to be communicated. In this figure, NE is the abbreviation for the neurotransmitter norepinephrine and ACh is the abbreviation for acetylcholine.

Excitatory and Inhibitory Messages

A neurotransmitter communicates either an excitatory or an inhibitory message to a postsynaptic neuron. An *excitatory message* increases the likelihood that the postsynaptic neuron will activate and generate an action potential. Conversely, an *inhibitory message* decreases the likelihood that the postsynaptic neuron will activate. If a postsynaptic neuron receives an excitatory and an inhibitory message simultaneously, the two messages cancel each other out.

It's important to note that the effect of any particular neurotransmitter depends on the particular *receptor* to which it binds. So, the same neurotransmitter can have an inhibitory effect on one neuron and an excitatory effect on another.

Depending on the number and kind of neurotransmitter chemicals that are bound to the receptor sites on the adjoining neurons, the postsynaptic neurons are more or less likely to activate. If the net result is a sufficient number of excitatory messages, the postsynaptic neuron depolarizes, generates an action potential, and releases its own neurotransmitters.

When released by a presynaptic neuron, neurotransmitter chemicals cross hundreds, even thousands, of synaptic gaps and affect the intertwined dendrites of adjacent neurons. Because the receiving neuron can have thousands of dendrites that intertwine with the axon terminals of many presynaptic neurons, the number of potential synaptic interconnections between neurons is truly mind-boggling. Each neuron in the brain communicates directly with an average of 1,000 other neurons (Hyman, 2005). However, some specialized neurons have as many as 100,000 connections with other neurons. Thus, there are up to 100 *trillion* synaptic interconnections in your brain (Eroglu & Barres, 2010). That's the number 10 followed by 14 zeros!

Neurotransmitters and Their Effects

Your ability to perceive, feel, think, move, act, and react depends on the delicate balance of neurotransmitters in your nervous system. Too much or too little of a given neurotransmitter can have devastating effects. Yet neurotransmitters are present in only minuscule amounts in the human body. If you imagine trying to detect a pinch of salt dissolved in an Olympic-sized swimming pool, you will have some idea of the infinitesimal amounts of neurotransmitters present in brain tissue.

In this section, you'll see that researchers have linked abnormal levels of specific neurotransmitters to various physical and behavioral problems (see Table 2.1 on the next page). Nevertheless, it's important to remember that any connection between a particular

- **acetylcholine** (uh-*seet*-ull-KO-leen) Neurotransmitter that causes muscle contractions and is involved in learning and memory.
- **dopamine** (DOPE-uh-meen) Neurotransmitter involved in the regulation of bodily movement, thought processes, and rewarding sensations.
- **serotonin** (ser-ah-TONE-in) Neurotransmitter involved in sensory perceptions, sleep, and emotions.
- **norepinephrine** (nor-ep-in-EF-rin) Neurotransmitter involved in learning, memory, and regulation of sleep; also a hormone manufactured by adrenal glands.

TABLE 2.1

Summary of Important Neurotransmitters

Neurotransmitter	Primary Roles	Associated Disorders
Acetylcholine	Learning, memory Muscle contractions	Alzheimer's disease
Dopamine	Movement Thought processes Rewarding sensations	Parkinson's disease Schizophrenia Drug addiction
Serotonin	Emotional states Sleep Sensory perception	Depression
Norepinephrine	Physical arousal Learning, memory Regulation of sleep	Depression, stress
GABA	Inhibition of brain activity	Anxiety disorders
Endorphins	Pain perception Positive emotions	Opiate addiction



AP Photo/Dan Steinberg

Turning Back the Clock with Botox Singer and award-winning actress Vanessa Williams is one of the few celebrities who cheerfully admits to using Botox to keep her youthful appearance. At 48, Williams has the unwrinkled forehead of someone half her age. How does Botox eliminate facial wrinkles? Botox injections contain very minute amounts of *botulinum*, a toxin that causes muscle paralysis around the injection site by blocking the release of acetylcholine from motor neurons. Because the muscles can't contract, the skin smoothes out, and facial wrinkles are diminished or eliminated. Produced by bacteria, botulinum is a deadly poison. But when purified and properly administered, botulinum toxin can safely treat migraine headaches and severe muscle spasms (Montecucco & Molgó, 2005).

neurotransmitter and a particular effect is *not* a simple one-to-one relationship. Most behaviors are the result of the complex interaction of different neurotransmitters. Further, neurotransmitters sometimes have different effects in different areas of the brain.

Important Neurotransmitters

Acetylcholine, the first neurotransmitter discovered, is found in all motor neurons. It stimulates muscles to contract, including the heart and stomach muscles. Whether it is as simple as the flick of an eyelash or as complex as a back flip, all movement involves acetylcholine.

Acetylcholine is also found in many neurons in the brain, and it is important in memory, learning, and general intellectual functioning. People with *Alzheimer's disease,* which is characterized by progressive loss of memory and deterioration of intellectual functioning, have a severe depletion of several neurotransmitters in the brain, most notably acetylcholine.

The neurotransmitter **dopamine** is involved in movement, attention, learning, and pleasurable or rewarding sensations. Evidence suggests that the addictiveness of many drugs, including cocaine and nicotine, is related to their ability to increase dopamine activity in the brain (Volkow & others, 2011).

The degeneration of the neurons that produce dopamine in one brain area causes *Parkinson's disease,* which is characterized by rigidity, muscle tremors, poor balance, and difficulty in initiating movements. Symptoms can be alleviated by a drug called *L-dopa,* which converts to dopamine in the brain.

Excessive brain levels of dopamine are sometimes involved in the hallucinations and perceptual distortions that characterize the severe mental disorder called *schizophrenia.* Some antipsychotic drugs that relieve schizophrenic symptoms work by blocking dopamine receptors and reducing dopamine activity in the brain. Unfortunately, these antipsychotic drugs can also produce undesirable side effects. Because the drugs reduce dopamine in several different areas of the brain, long-term use sometimes produces symptoms that are very similar to those of Parkinson's disease. In the chapters on psychological disorders (Chapter 14) and therapies (Chapter 15), we'll discuss schizophrenia, dopamine, and antipsychotic drugs in more detail.

The neurotransmitters **serotonin** and **norepinephrine** are found in many different brain areas. Serotonin is involved in sleep, sensory perceptions, moods, and emotional states, including depression. Antidepressant drugs such as *Prozac* increase

the availability of serotonin in certain brain regions. Norepinephrine is implicated in the activation of neurons throughout the brain and helps the body gear up in the face of danger or threat. Norepinephrine also plays a key role in the regulation of sleep, learning, and memory retrieval (McCarley, 2007). Like serotonin and dopamine, norepinephrine dysfunction is implicated in some mental disorders, especially depression (Goddard & others, 2010).

GABA is the abbreviation for **gamma-aminobutyric acid,** a neurotransmitter found primarily in the brain. GABA usually communicates an inhibitory message to other neurons, helping to balance and offset excitatory messages. For normal functioning, GABA must be finely balanced. Like a dimmer switch, GABA regulates excitation in the brain. Too much GABA impairs learning, motivation, and movement, but too little GABA can lead to seizures (McCarthy, 2007). Alcohol makes people feel relaxed and less inhibited partly by increasing GABA activity, which reduces brain activity. Antianxiety medications, such as Valium and Xanax, also work by increasing GABA activity, which inhibits action potentials.



Reuters/Corbis

Dopamine and Parkinson's Disease Boxing legend Muhammad Ali fakes a swing at actor Michael J. Fox before they both testified at a Congressional hearing on Parkinson's disease. Parkinson's disease affects approximately 1.5 million Americans, with an estimated 60,000 new cases diagnosed each year. Parkinson's disease usually affects older adults, but Fox was diagnosed with Parkinson's at the age of 30. Muhammad Ali has Parkinson's syndrome, a related disease thought to be caused by brain damage he suffered from years of professional boxing. Caused by the degeneration of dopamine-producing neurons, Parkinson's symptoms include uncontrollable trembling, rigid or stiff muscles, impaired balance, and movement and speech difficulties. To help ease their symptoms, both Ali and Fox take medications containing L-dopa, which temporarily increases brain levels of dopamine.

Endorphins: Regulating the Perception of Pain

In 1973, researchers Candace Pert and Solomon Snyder of Johns Hopkins University made the startling discovery that the brain contains receptor sites that are specific for the group of painkilling drugs called *opiates* (Pert & Snyder, 1973). Opiates include morphine, heroin, and codeine, all derived from the opium poppy. In addition to alleviating pain, opiates often produce a state of euphoria. Why would the brain have receptor sites for specific drugs like morphine? Pert, Snyder, and other researchers concluded that the brain must manufacture its own painkillers, morphine-like chemicals that act as neurotransmitters.

Within a few years, researchers identified a number of such chemicals manufactured by the brain (Snyder, 1984). Collectively, they are called **endorphins,** a term derived from the phrase *endogenous morphines.* (The word *endogenous* means "produced internally in the body.") Although chemically similar to morphine, endorphins are 100 times more potent. Today, it is known that endorphins are released in response to stress or trauma and that they reduce the perception of pain.

Researchers have found that endorphins are implicated in the pain-reducing effects of *acupuncture,* an ancient Chinese medical technique that involves inserting needles at various locations in the body (Kemmer, 2007; Zhao, 2008). Endorphins are also associated with positive mood. For example, the "runner's high" associated with aerobic exercise has been attributed to endorphins, a topic that is examined in the Focus on Neuroscience, "Is 'Runner's High' an Endorphin Rush?" on the next page.

How Drugs Affect Synaptic Transmission

Much of what is known about different neurotransmitters has been learned from observing the effects of drugs and other substances. Many drugs, especially those that affect moods or behavior, work by interfering with the normal functioning of neurotransmitters in the synapse (Volkow & others, 2011).

As Figure 2.7 on the next page illustrates, some drugs increase or decrease the amount of neurotransmitter released by neurons. For example, the venom of a black widow spider bite causes acetylcholine to be released continuously by motor neurons, causing severe muscle spasms. Drugs may also affect the length of time the neurotransmitter remains in the synaptic gap, either increasing or decreasing the amount available to the postsynaptic receptor.

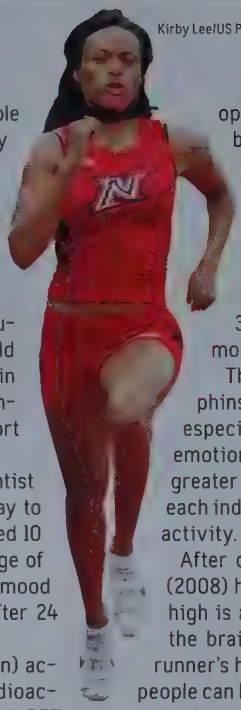
One way in which drugs can prolong the effects of the neurotransmitter is by blocking the reuptake of the neurotransmitter by the sending neuron. For example,

GABA (gamma-aminobutyric acid) Neurotransmitter that usually communicates an inhibitory message.

endorphins (en-DORF-ins) Neurotransmitters that regulate pain perceptions.

FOCUS ON NEUROSCIENCE

Is "Runner's High" an Endorphin Rush?



Kirby Lee/US Presswire

"Runner's high" is the rush of euphoria that many people experience after sustained aerobic exercise, especially running or cycling. It's thought to be caused by endorphins, which are associated with positive moods and reduced feelings of pain.

Although blood levels of one type of endorphins, called *beta-endorphins*, do increase during intense exercise, it seems unlikely that beta-endorphins cause runner's high. Why? Because the beta-endorphins circulating in the blood do *not* affect the brain. When you add the fact that it's impossible to directly measure endorphin levels in the intact human brain, the "endorphin hypothesis" of runner's high has lacked solid evidence to support it (Dietrich & McDaniel, 2004).

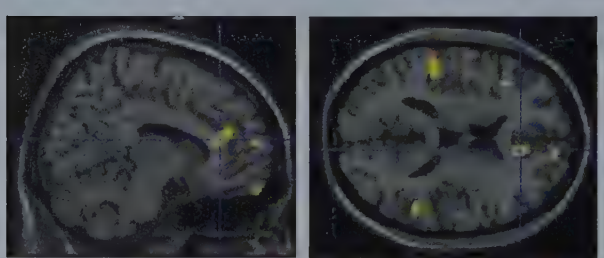
But an ingenious experiment by German neuroscientist Henning Boecker and his colleagues (2008) found a way to directly test the endorphin hypothesis. Boecker recruited 10 highly conditioned male runners who trained an average of eight or more hours per week. The runners completed mood questionnaires and underwent a baseline PET scan after 24 hours with no physical exertion.

To indirectly measure endogenous opioid (endorphin) activity in the brain, the runners were injected with a radioactively tagged chemical that binds to opioid receptors. A PET scan detects the radioactively tagged chemical. The reasoning was that if endorphins were released in the brain during exercise, the radioactive substance would be unable to bind to the opioid receptors because the receptors would already be occupied by the brain's own natural opioids—the endorphins. Thus, the number of opioid receptors that did *not* take up the radioactive chemical would provide an accurate measure of endorphin activity caused by the long-distance running.

On the day of the second PET scan, each participant returned to the lab after a two-hour run. After a 30-minute cool down, each athlete again completed the mood questionnaire, followed by a second PET scan.

The post-run PET scans showed high levels of endorphins binding to opioid receptors in several brain regions, especially frontal regions known to be involved in positive emotions (see figure). The analysis also showed that the greater the subjective feelings of euphoria experienced by each individual runner, the *higher* the brain level of endorphin activity.

After decades of speculation, Boecker and his colleagues (2008) have provided the first human evidence that runner's high is at least partially due to the release of endorphins in the brain. The involvement of the brain's opioid system in runner's high suggests one possible explanation for why some people can become addicted to excessive exercise, continuing to train despite illness or injuries. But endorphins do not provide a complete explanation. As the researchers point out, other neurotransmitters, such as dopamine, are probably also involved in runner's high.



From Cerebral Cortex doi: 10.1093/cercor/bhn013, "The Runner's High: Opiodergic Mechanisms in the Human Brain," Boecker, Henning, figure 4, p9. By permission of Oxford University Press.

Endorphins and Runner's High After two hours of endurance running, highly conditioned athletes underwent PET scans. Yellow and orange highlight regions in which opioid receptors were blocked by the athlete's naturally produced endorphins. Endorphin activity was highest in regions known to be involved in positive emotion and mood, including the frontal cortex. The scans also showed that endorphin activity was positively correlated with subjective experience: The more intense the euphoria experienced by the individual runner, the higher the level of endorphin activity in his brain.

there is a category of antidepressant medications that are referred to as SSRIs, which stands for *selective serotonin reuptake inhibitors*. SSRIs include such trade name medications as Prozac, Zoloft, and Paxil. Each of these medications inhibits the reuptake of serotonin in certain neurons, increasing the availability of serotonin in the brain. Similarly, the illegal drug cocaine produces its exhilarating rush by interfering with the reuptake of dopamine (Volkow & others, 2011).

Drugs can also mimic specific neurotransmitters. An **agonist** is a drug or other chemical that binds to a receptor. Agonist drugs are chemically similar to a specific neurotransmitter and produce the same effect. For example, nicotine is a stimulant because it is chemically similar to acetylcholine. It occupies acetylcholine receptor sites, stimulating skeletal muscles and causing the heart to beat more rapidly.

agonist Drug or other chemical substance that binds to a receptor site and triggers a response in the cell.

antagonist Drug or other chemical substance that blocks a receptor site and inhibits or prevents a response in the receiving cell.

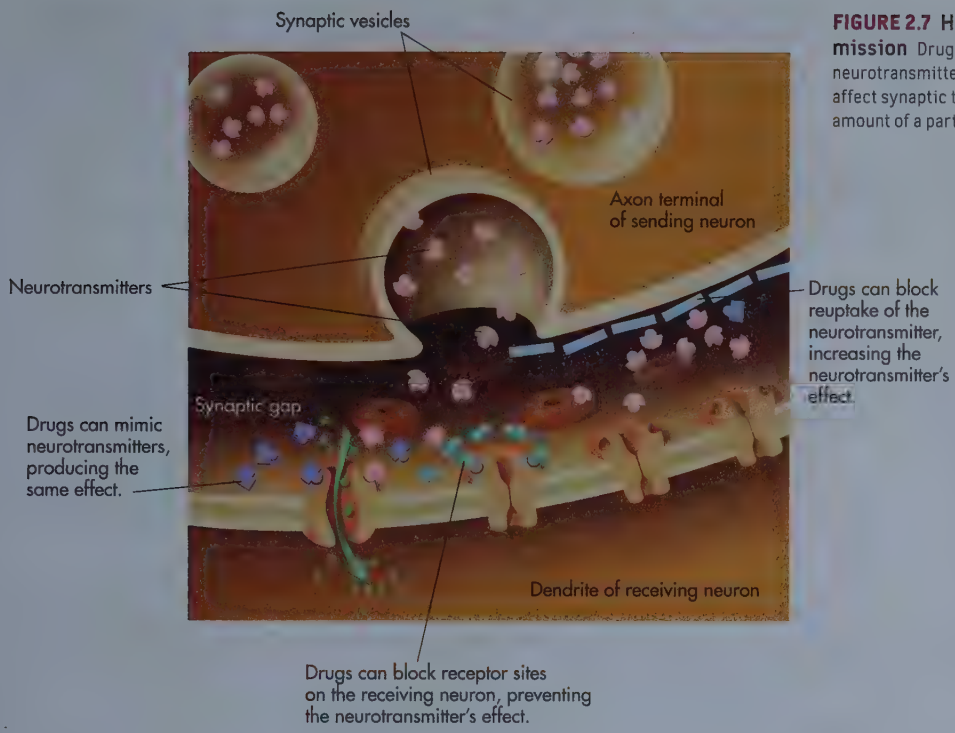


FIGURE 2.7 How Drugs Affect Synaptic Transmission Drugs affect brain activity by interfering with neurotransmitter functioning in the synapse. Drugs may also affect synaptic transmission by increasing or decreasing the amount of a particular neurotransmitter that is produced.

Alternatively, a drug can act as an **antagonist** by *blocking* the effect of neurotransmitters. A drug may fit into receptor sites and prevent neurotransmitters from acting. For example, the drug *curare* blocks acetylcholine receptor sites, causing virtually instantaneous paralysis. The brain sends signals to the motor neurons, but the muscles can't respond because the motor neuron receptor sites are blocked by the curare. Similarly, the drug *naloxone* acts as an antagonist at opioid receptor sites and eliminates the effects of both endorphins and opiates. For the same reason, it is used as an antidote in cases of overdoses of heroin or other opiate drugs such as oxycodone. Because it is an opiate antagonist, it prevents or reverses the effects of opioid drugs (Rich & others, 2011).

CONCEPT REVIEW 2.1

The Neuron

Match the part of the neuron in the list with its function in neural communication. Answers appear on the final page of the chapter.

a. action potential
b. axon
c. synaptic gap
d. myelin sheath
e. neurotransmitters
f. dendrite

_____ 1. A fluid-filled tube that carries information to other neurons, glands, and muscles

_____ 2. Receives information from other neurons

_____ 3. Brief electrical charge that communicates information within the neuron

_____ 4. Fluid-filled space between sending and receiving neurons

_____ 5. Chemical messengers manufactured by a neuron

_____ 6. White, fatty covering surrounding an axon that increases the speed of neural communication



FIGURE 2.8 The Nervous System The nervous system is a complex, organized communication network that is divided into two main divisions: the central nervous system (shown in blue) and the peripheral nervous system (shown in yellow).

The Nervous System and the Endocrine System

Communication Throughout the Body

KEY THEME

› Two major communication systems in the body are the nervous system and the endocrine system.

KEY QUESTIONS

› What are the divisions of the nervous system and their functions?

› How is information transmitted in the endocrine system, and what are its major structures?

› How do the nervous and endocrine systems interact to produce the fight-or-flight response?

Specialized for communication, up to 1 *trillion* neurons are linked throughout your body in a complex, organized communication network called the **nervous system.** The human nervous system is divided into two main divisions: the *central nervous system* and the *peripheral nervous system* (see Figure 2.8). For even simple behaviors to occur, such as curling your toes or scratching your nose, these two divisions must function as a single, integrated unit. Yet each of these divisions is highly specialized and performs different tasks.

The neuron is the most important transmitter of messages in the central nervous system. In the peripheral nervous system, communication occurs along **nerves.** Nerves and neurons are not the same thing. Nerves are made up of large bundles of neuron axons. Unlike neurons, many nerves are large enough to be seen easily with the unaided eye.

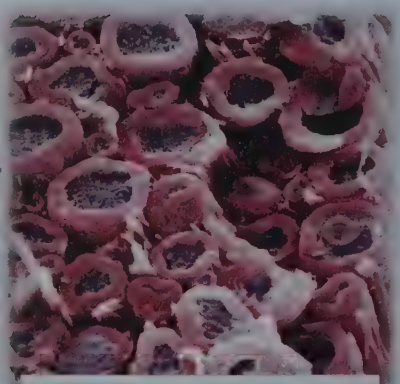
The Central Nervous System

The **central nervous system (CNS)** includes the brain and the spinal cord. The central nervous system is so critical to your ability to function that it is entirely protected by bone—the brain by your skull and the spinal cord by your spinal column. Surrounding and protecting the brain and the spinal cord are three layers of membranous tissues, called the *meninges.* As an added measure of protection, the brain and spinal cord are suspended in *cerebrospinal fluid* to protect them from being jarred.

Cerebral spinal fluid also fills four hollow cavities in the brain, called *ventricles.* The inner surfaces of the ventricles are lined with *neural stem cells,* specialized cells that generate neurons in the developing brain. Despite these layers of protection, the brain is highly susceptible to injury. Just a quarter inch of bone and membranes protect the brain from harm. A sharp blow to the head or body can cause your brain to literally crash into your skull. The shock wave from an explosion, such as a bomb blast, can also violently jar the brain, even when the head is protected by a helmet or other protective headgear. Thus, a soldier may appear to be uninjured but still have a severe brain injury (Sponheim & others, 2011).

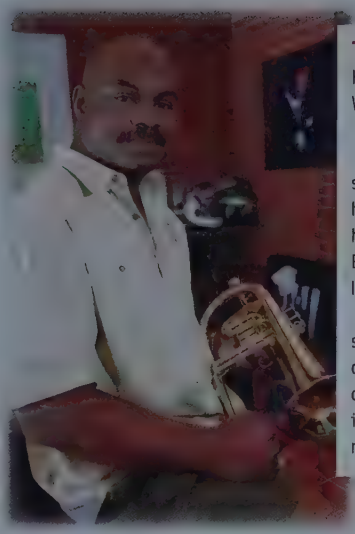
When such an event disrupts normal brain functioning, a *traumatic brain injury* (or *TBI)* may be diagnosed. A *concussion* is the most common, and mildest, type of TBI, affecting hundreds of thousands of people worldwide every year (Barkhoudarian & others, 2011).

Traditionally, concussion has been defined as a disruption of normal functioning that occurs in the absence of any discernible structural or physical damage to the brain. However, we know now that concussions can cause physical damage and



ON PAGE: Dr. Richard Kessel & Dr. Randy Kardon/ Tissues & Organs/Visuals Unlimited, Inc.

Nerves and Neurons Are Not the Same A cross section of a peripheral nerve is shown in this electron micrograph. The nerve is composed of bundles of axons (dark circles) wrapped in the myelin sheath. In the peripheral nervous system, myelin is formed by a type of glial cell called *Schwann cells,* shown here as a pinkish coating around the axons.



Chicago Tribune Photo By David Trotman-Wilkins

The Dangers of Cumulative Concussions: Chronic Traumatic Encephalopathy

Hockey player Bob Probert. Football players John Grimsley and Chris Henry. Wrestler Chris Benoit. What do these men have in common? All are professional athletes whose brains, after their deaths, displayed telltale signs of *chronic traumatic encephalopathy*, or CTE (Gavett & others, 2011).

After leaving the NFL, Dave Duerson, shown here, became a successful businessman and spokesperson for the NFL players union. Troubled by headaches, memory problems, and impulses he couldn't control, Duerson suspected he, too, might have developed CTE. Just before shooting himself in the chest, Duerson texted his ex-wife, asking her to donate his brain to the "NFL Brain Bank," meaning the Boston University Center for the Study of Traumatic Encephalopathy. Months later, it was confirmed: Duerson had advanced CTE.

Duerson and the other pro athletes with CTE were known to have suffered multiple concussions. But consider the case of Thomas Owens, a popular, academically successful 21-year-old college football player who committed suicide after complaining of stress. Owens had no history of concussion or head injury, but his brain showed clear signs of CTE. Neurologists believe that it was caused by the thousands of low-impact hits his brain had absorbed over years of playing middle school, high school, and college football.

disrupt many aspects of brain function. As the brain twists or bounces, axons are sheared, myelin damaged, and brain chemistry disrupted. Although damage may not be evident on a CAT or MRI scan, it's obvious in the behavioral manifestations of concussion: loss of consciousness, dizziness, blurred or double vision, slurred speech and memory loss, among others (Nierengarten, 2011).

Most people recover from concussions without complications. However, repeated concussions can lead to a serious brain disease called *chronic traumatic encephalopathy,* or *CTE* (see photo). CTE is a progressive, degenerative brain disease that can only be diagnosed after death. Symptoms include depression and anxiety, poor judgment and lack of impulse control, and problems with memory, concentration, and attention, and, ultimately, dementia (Gavett & others, 2011). Increasingly, CTE has been diagnosed in professional athletes, especially football players.

The central nervous system is aptly named. It is central to all your behaviors and mental processes. And it is the central processing center—every action, thought, feeling, and sensation you experience is processed through the central nervous system. The most important element of the central nervous system is, of course, the brain, which acts as the command center. We'll take a tour of the human brain in a later section.

The spinal cord handles both incoming and outgoing messages. Sensory receptors send messages along sensory nerves to the spinal cord, then up to the brain. To activate muscles, the brain sends signals down the spinal cord, which are relayed out along motor nerves to the muscles.

Most behaviors are controlled by your brain. However, the spinal cord can produce **spinal reflexes**—simple, automatic behaviors that occur without any brain involvement. For example, the *withdrawal reflex* occurs when you touch a painful stimulus, such as something hot, electrified, or sharp. As you can see in Figure 2.9 on the next page, this simple reflex involves a loop of rapid communication among *sensory neurons,* which communicate sensation to the spinal cord; *interneurons,* which relay information within the spinal cord; and *motor neurons,* which signal the muscles to react.

Spinal reflexes are crucial to your survival. The additional few seconds that it would take you to consciously process sensations and decide how to react could result in serious injury. Spinal reflexes are also important as indicators that the neural pathways in your spinal cord are working correctly. That's why physicians test spinal reflexes during neurological examinations by tapping just below your kneecap for the knee-jerk spinal reflex or scratching the sole of your foot for the toe-curl spinal reflex.

- **nervous system** The primary internal communication network of the body; divided into the central nervous system and the peripheral nervous system.
- **nerves** Bundles of neuron axons that carry information in the peripheral nervous system.
- **central nervous system (CNS)** Division of the nervous system that consists of the brain and spinal cord.
- **spinal reflexes** Simple, automatic behaviors that are processed in the spinal cord.

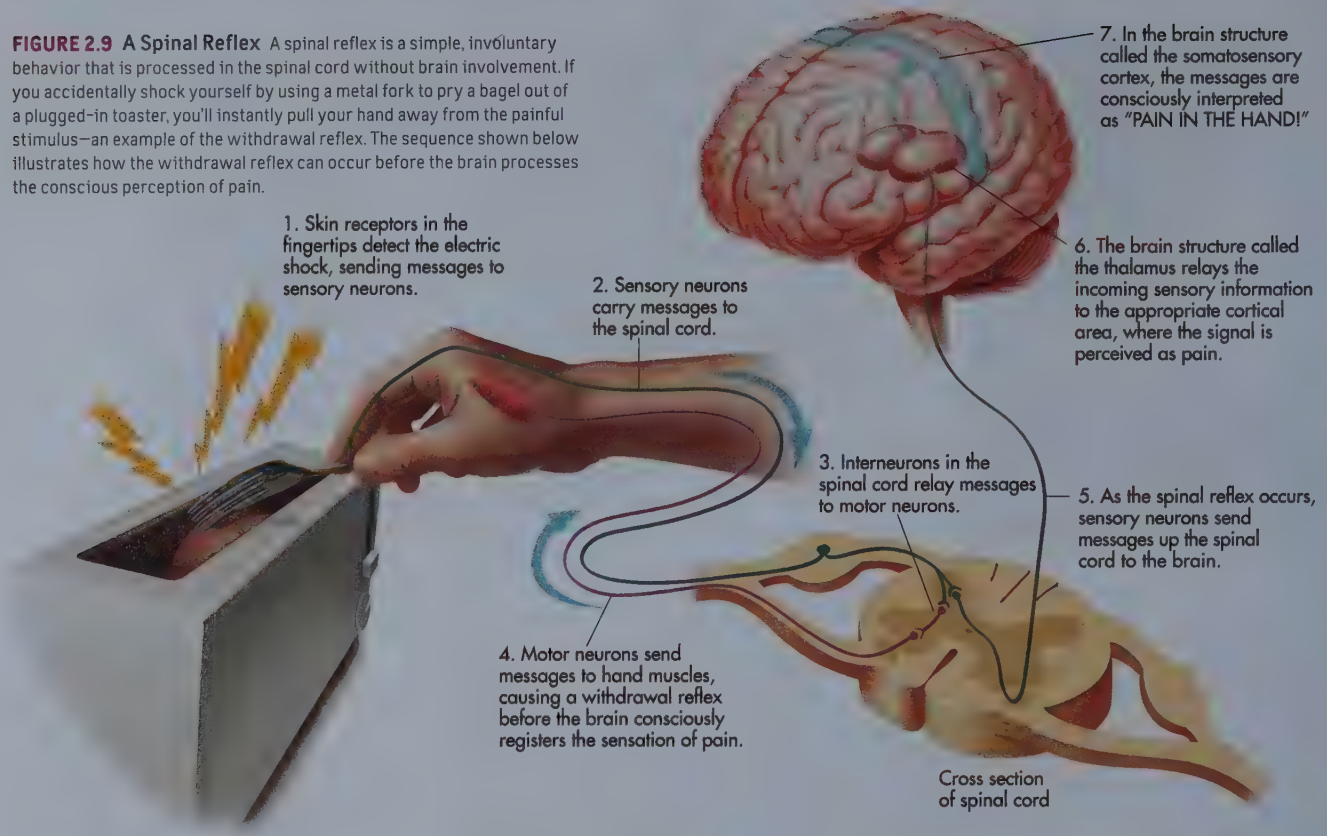


FIGURE 2.9 A Spinal Reflex A spinal reflex is a simple, involuntary behavior that is processed in the spinal cord without brain involvement. If you accidentally shock yourself by using a metal fork to pry a bagel out of a plugged-in toaster, you'll instantly pull your hand away from the painful stimulus—an example of the withdrawal reflex. The sequence shown below illustrates how the withdrawal reflex can occur before the brain processes the conscious perception of pain.

The Peripheral Nervous System

The **peripheral nervous system** is the other major division of your nervous system. The word peripheral means "lying at the outer edges." Thus, the *peripheral* nervous system comprises all the nerves outside the central nervous system that extend to the outermost borders of your body, including your skin. The communication functions of the peripheral nervous system are handled by its two subdivisions: the *somatic nervous system* and the *autonomic nervous system.*

The **somatic nervous system** takes its name from the Greek word *soma,* which means "body." It plays a key role in communication throughout the entire body. First, the somatic nervous system communicates sensory information received by sensory receptors along sensory nerves *to* the central nervous system. Second, it carries messages *from* the central nervous system along motor nerves to perform voluntary muscle movements. All the different sensations that you're experiencing right now are being communicated by your somatic nervous system to your spinal cord and on to your brain. When you perform a voluntary action, such as turning a page of this book, messages from the brain are communicated down the spinal cord, and then out to the muscles via the somatic nervous system.

The other subdivision of the peripheral nervous system is the **autonomic nervous system.** The word *autonomic* means "self-governing." Thus, the autonomic nervous system regulates *involuntary* functions, such as heartbeat, blood pressure, breathing, and digestion. These processes occur with little or no conscious involvement. This is fortunate because if you had to mentally command your heart to beat or your stomach to digest the food you had for lunch, it would be difficult to focus your attention on anything else.

However, the autonomic nervous system is not completely self-regulating. By engaging in physical activity or purposely tensing or relaxing your muscles, you can increase or decrease autonomic activity. Emotions and mental imagery also influ-

peripheral nervous system (per-IF-er-ull) Division of the nervous system that includes all the nerves lying outside the central nervous system.

somatic nervous system Subdivision of the peripheral nervous system that communicates sensory information to the central nervous system and carries motor messages from the central nervous system to the muscles.

autonomic nervous system (aw-toe-NOM-ick) Subdivision of the peripheral nervous system that regulates involuntary functions.

sympathetic nervous system Branch of the autonomic nervous system that produces rapid physical arousal in response to perceived emergencies or threats.

ence your autonomic nervous system. Vividly imagining a situation that makes you feel angry, frightened, or even sexually aroused can dramatically increase your heart rate and blood pressure. A peaceful mental image can lower many autonomic functions.

The involuntary functions regulated by the autonomic nervous system are controlled by two different branches: the *sympathetic* and *parasympathetic nervous systems*. These two systems control many of the same organs in your body but cause them to respond in opposite ways (see Figure 2.10). In general, the sympathetic nervous system arouses the body to expend energy, and the parasympathetic nervous system helps the body conserve energy.

The **sympathetic nervous system** is the body's emergency system, rapidly activating bodily systems to meet threats or emergencies. When you are frightened, your breathing accelerates, your heart beats faster, digestion stops, and the bronchial tubes in your lungs expand. All these physiological responses increase the amount of oxygen available to your brain and muscles. Your pupils dilate to increase your field of vision, and your mouth becomes dry, because salivation stops. You begin to sweat in response to your body's expenditure of greater energy and heat. These bodily changes collectively represent the *fight-or-flight response*—they physically prepare you to fight or to flee from a perceived danger. We'll discuss the fight-or-flight response in greater detail in Chapter 8, on emotion, and Chapter 13, on stress.



Activating the Sympathetic Nervous System When the sympathetic nervous system activates in humans, tiny muscles in the skin contract, which elevates your hair follicles, producing the familiar sensation of "goose bumps" and making your hair stand on end. A similar process takes place in many mammals, making the fur or hair bristle, with rather spectacular results in this kitten.

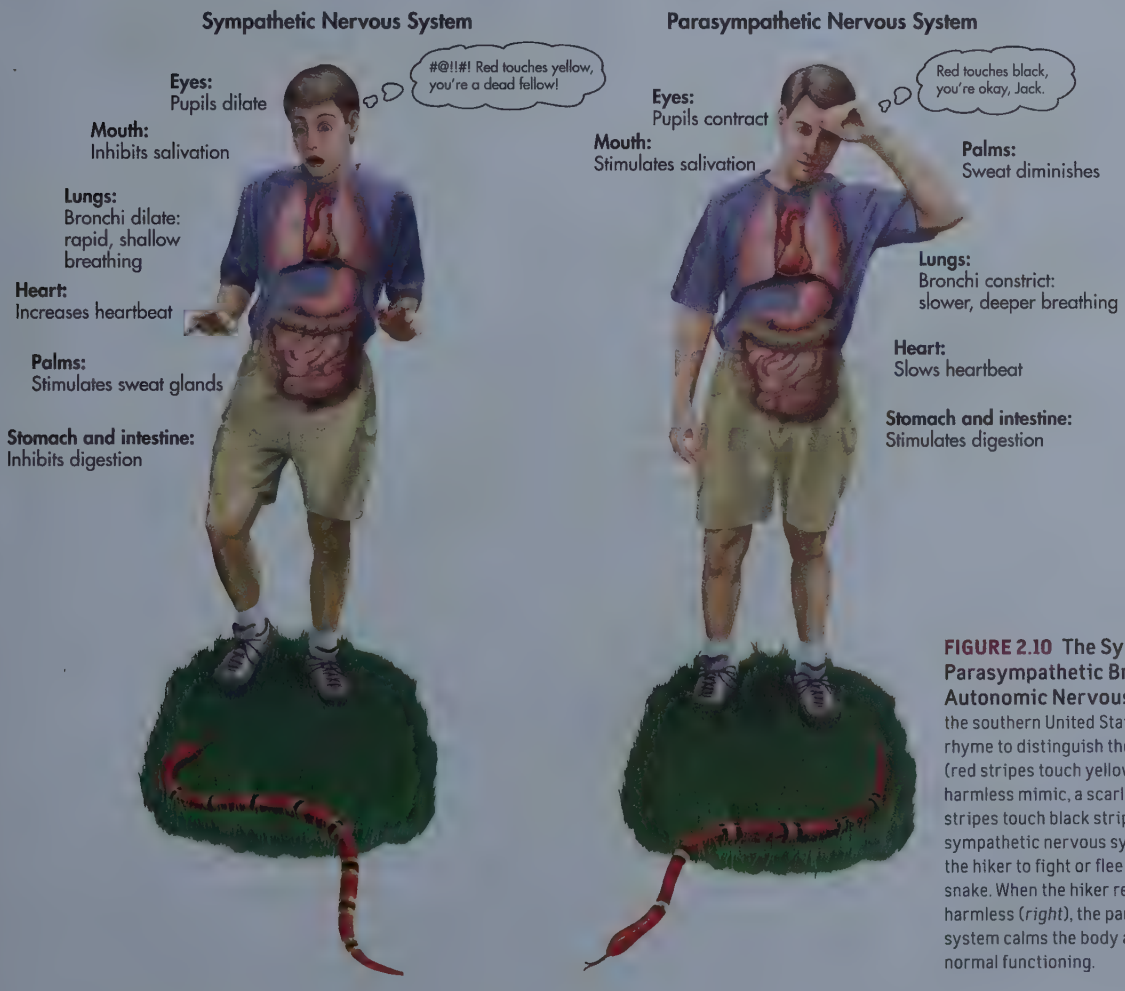


FIGURE 2.10 The Sympathetic and Parasympathetic Branches of the Autonomic Nervous System Hikers in the southern United States memorize a simple rhyme to distinguish the venomous coral snake (red stripes touch yellow stripes) from its harmless mimic, a scarlet king snake (red stripes touch black stripes). Arousal of the sympathetic nervous system (*left*) prepares the hiker to fight or flee from the dangerous snake. When the hiker realizes that the snake is harmless (*right*), the parasympathetic nervous system calms the body and gradually restores normal functioning.

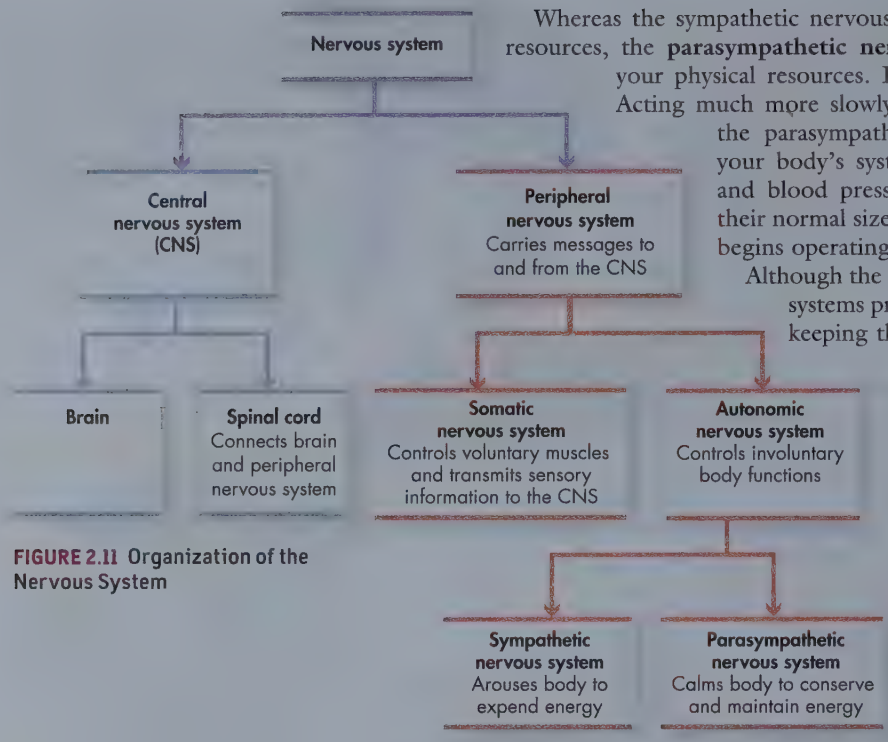


FIGURE 2.11 Organization of the Nervous System

Whereas the sympathetic nervous system mobilizes your body's physical resources, the **parasympathetic nervous system** conserves and maintains your physical resources. It calms you down after an emergency. Acting much more slowly than the sympathetic nervous system, the parasympathetic nervous system gradually returns your body's systems to normal. Heart rate, breathing, and blood pressure level out. Pupils constrict back to their normal size. Saliva returns, and the digestive system begins operating again.

Although the sympathetic and parasympathetic nervous systems produce opposite effects, they act together, keeping the nervous system in balance (see Figure 2.11). Each division handles different functions, yet the whole nervous system works in unison so that both automatic and voluntary behaviors are carried out smoothly.

The Endocrine System

As you can see in Figure 2.12, the **endocrine system** is made up of glands that are located throughout the body. Like the nervous system, the endocrine system involves the use of chemical messengers to transmit information from one part of the body to another. Although the endocrine system is not part of the nervous system, it interacts with the nervous system in some important ways.

Endocrine glands communicate information from one part of the body to another by secreting messenger chemicals called **hormones** into the bloodstream. The hormones circulate throughout the bloodstream until they reach specific hormone receptors on target organs or tissue. Hormones regulate physical processes and influence behavior in a variety of ways. Metabolism, growth rate, digestion, blood pressure, and sexual development and reproduction are just some of the processes that are regulated by the endocrine hormones. Hormones are also involved in emotional response and your response to stress.

Endocrine hormones are closely linked to the workings of the nervous system. For example, the release of hormones may be stimulated or inhibited by certain parts of the nervous system. In turn, hormones can promote or inhibit the generation of nerve impulses. Finally, some hormones and neurotransmitters are chemically identical. The same molecule can act as a hormone in the endocrine system and as a neurotransmitter in the nervous system.

In contrast to the rapid speed of information transmission in the nervous system, communication in the endocrine system takes place much more slowly. Hormones rely on the circulation of the blood to deliver their chemical messages to target organs, so it may take a few seconds or longer for the hormone to reach its target organ after it has been secreted by the originating gland.

The signals that trigger the secretion of hormones are regulated by the brain, primarily by a brain structure called the *hypothalamus*. (You'll learn more about the hypothalamus later in the chapter.) The hypothalamus serves as the main link between the endocrine system and the nervous system. The hypothalamus directly regulates the release of hormones by the **pituitary gland,** a pea-sized gland just under the brain. The pituitary's hormones, in turn, regulate the production of other hormones by many of the glands in the endocrine system. This is why the pituitary gland is often referred to as the body's master gland. Under the direction of the hypothalamus, the pituitary gland controls hormone production in other endocrine glands.

parasympathetic nervous system Branch of the autonomic nervous system that maintains normal bodily functions and conserves the body's physical resources.

endocrine system (EN-doe-krin) System of glands, located throughout the body, that secrete hormones into the bloodstream.

hormones Chemical messengers secreted into the bloodstream primarily by endocrine glands.

pituitary gland (pih-TOO-ih-tare-ee) Endocrine gland attached to the base of the brain that secretes hormones that affect the function of other glands as well as hormones that act directly on physical processes.

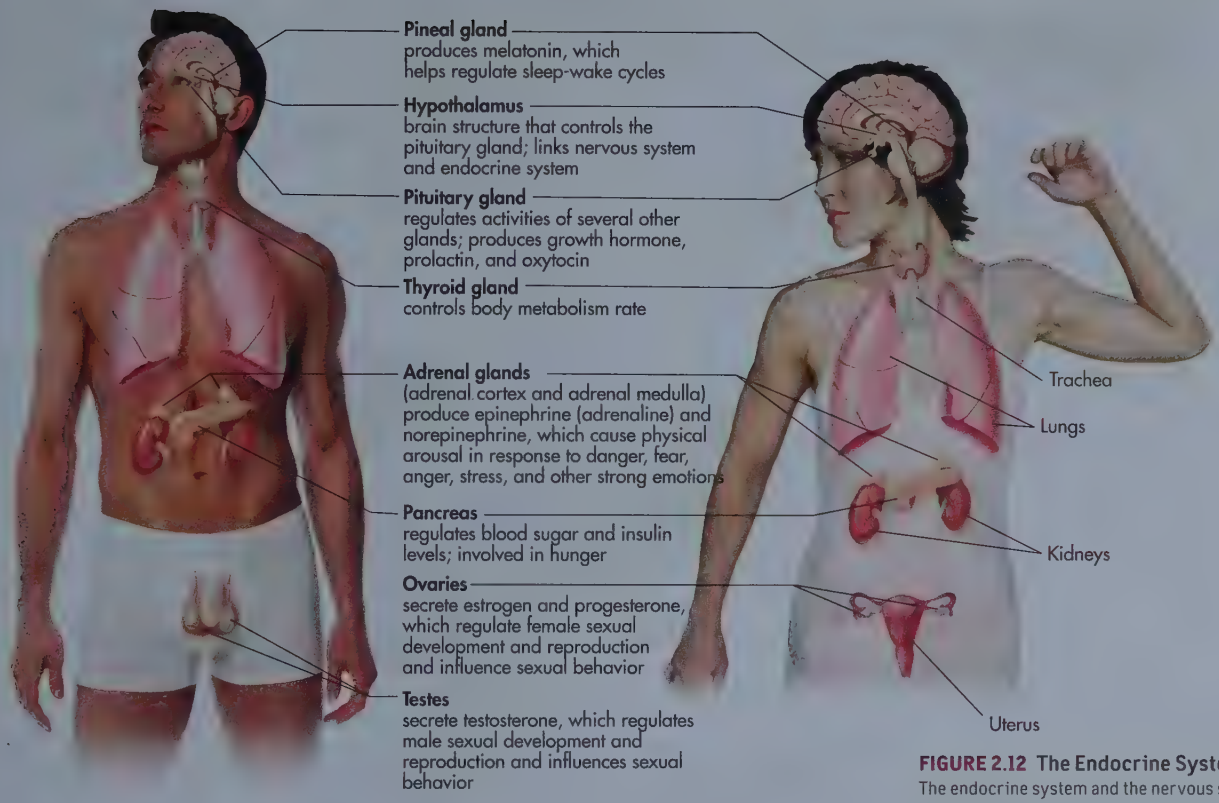


FIGURE 2.12 The Endocrine System
The endocrine system and the nervous system are directly linked by the hypothalamus in the brain, which controls the pituitary gland. In turn, the pituitary releases hormones that affect the hormone production of several other endocrine glands. In the male and female figures shown here, you can see the location and main functions of several important endocrine glands.

The pituitary gland also produces some hormones that act directly. For example, the pituitary produces *growth hormone,* which stimulates normal skeletal growth during childhood. The pituitary gland can also secrete endorphins to reduce the perception of pain. In nursing mothers, the pituitary produces both *prolactin,* the hormone that stimulates milk production, and *oxytocin,* the hormone that produces the let-down reflex, in which stored milk is "let down" into the nipple. Breast-feeding is a good example of the complex interaction among behavior, the nervous system, and the endocrine system (see Figure 2.13 on the next page).

Another set of glands, called the **adrenal glands,** is of particular interest to psychologists. The adrenal glands consist of the **adrenal cortex,** which is the outer gland, and the **adrenal medulla,** which is the inner gland. Both the adrenal cortex and the adrenal medulla produce hormones that are involved in the human stress response. As you'll see in Chapter 13, on stress, hormones secreted by the adrenal cortex also interact with the *immune system,* the body's defense against invading viruses or bacteria.

The adrenal medulla plays a key role in the fight-or-flight response, described earlier. When aroused, the sympathetic nervous system stimulates the adrenal medulla. In turn, the adrenal medulla produces *epinephrine* and *norepinephrine.* (You may be more familiar with the word *adrenaline,* which is another name for epinephrine.)

As they circulate through the bloodstream to the heart and other target organs, epinephrine and norepinephrine complement and enhance the effects of the sympathetic nervous system. These hormones also act as neurotransmitters, stimulating activity at the synapses in the sympathetic nervous system. The action of epinephrine and norepinephrine is a good illustration of the long-lasting effects of hormones. If you've noticed that it takes a while for you to calm down after a particularly upsetting or stressful experience, it's because of the lingering effects of epinephrine and norepinephrine in your body.

adrenal glands Pair of endocrine glands that are involved in the human stress response.

adrenal cortex The outer portion of the adrenal glands.

adrenal medulla The inner portion of the adrenal glands; secretes epinephrine and norepinephrine.

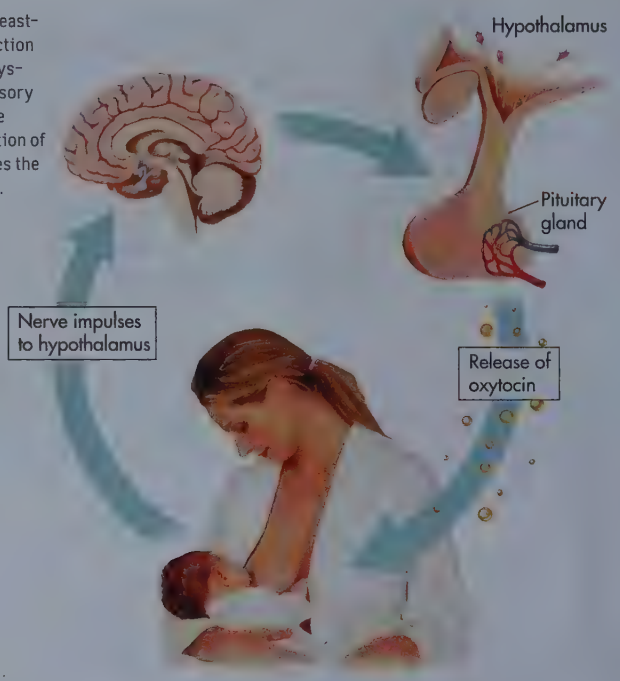


FIGURE 2.13 Interacting Systems Breastfeeding is an example of the complex interaction among the nervous system, the endocrine system, and behavior. Nerve impulses from sensory receptors in the mother's skin are sent to the brain. The hypothalamus signals the production of oxytocin by the pituitary gland, which causes the mother's milk to let down and begin flowing.

Also important are the **gonads,** or sex organs—the *ovaries* in women and the *testes* in men. In women, the ovaries secrete the hormones *estrogen* and *progesterone*. In men, the testes secrete male sex hormones called *androgens,* the most important of which is *testosterone*. Testosterone is also secreted by the adrenal glands in both males and females. In both males and females, the sex hormones influence sexual development, sexual behavior, and reproduction.

gonads The endocrine glands that secrete hormones that regulate sexual characteristics and reproductive processes; *ovaries* in females and *testes* in males.

CONCEPT REVIEW 2.2

The Nervous System and the Endocrine System

Circle the letter of the item that correctly completes each statement.

1. While watching a suspenseful video late at night, you hear a sudden crash in another room. You leap out of your chair in fear, then realize that your dog has knocked over the trash again. Your fear reaction involved the activation of the _____ of the nervous system. Calming down involved the _____ of the nervous system.
   a. hypothalamus; endocrine branch
   b. somatic branch; sympathetic division
   c. sympathetic division; parasympathetic division
   d. parasympathetic division; sympathetic division

2. The part of the nervous system that controls voluntary movement is the _____.
   a. parasympathetic nervous system
   b. somatic nervous system
   c. autonomic nervous system
   d. fight-or-flight response

3. The glands of the endocrine system communicate via _____.
   a. electrically charged ion channels
   b. neural impulses along the axon
   c. spinal reflexes
   d. chemical messengers called hormones

4. The main link between the nervous system and the endocrine system occurs at the _____.
   a. adrenal glands
   b. pineal gland
   c. somatic nervous system
   d. hypothalamus

5. In response to stress, epinephrine is pumped into the bloodstream by the _____.
   a. adrenal glands
   b. pineal gland
   c. thyroid gland
   d. pituitary gland

A Guided Tour of the Brain

KEY THEME

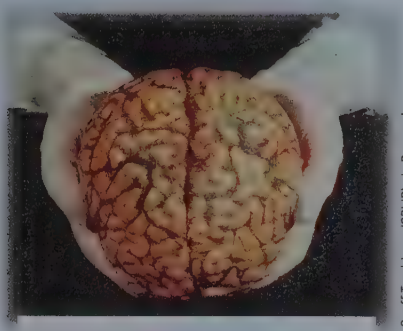
› The brain is a highly complex, integrated, and dynamic system of interconnected neurons.

KEY QUESTIONS

› What are neural pathways and why are they important?

› What are functional and structural plasticity?

› What is neurogenesis, and what is the evidence for its occurrence in the adult human brain?



Geoff Tomkinson/SPL/Photo Researchers

The Human Brain Weighing roughly three pounds, the human brain is about the size of a small cauliflower. Although your brain makes up only about 2 percent of your total body weight, it uses some 20 percent of the oxygen your body needs while at rest. The oxygen is used in breaking down glucose to supply the brain with energy.

Think about it: the most complex mass of matter in the universe sits right behind your eyes and between your two ears—your brain. Not even the Internet can match the human brain for speed and sophistication of information transmission.

In this part of the chapter, we'll take you on a guided tour of the human brain. As your tour guides, our goal here is not to tell you everything that is known or suspected about the human brain. Such an endeavor would take stacks of books rather than a single chapter in a college textbook. Instead, our first goal is to familiarize you with the basic organization and structures of the brain. Our second goal is to give you a general sense of how the brain works. In later chapters, we'll add to your knowledge of the brain as we discuss the brain's involvement in specific psychological processes.

At the beginning of this tour, it's important to note that the brain generally does not lend itself to simple explanations. One early simplistic approach to mapping the brain is discussed in Science Versus Pseudoscience, "Phrenology: The Bumpy Road to Scientific Progress" on the next page. Although we will identify the functions that seem to be associated with particular brain regions, it's important to remember that specific functions seldom correspond neatly to a single, specific brain site. Most psychological processes, especially complex ones, involve *multiple* brain structures and regions. Even seemingly simple tasks—such as carrying on a conversation, catching a ball, or watching a movie—involve the smoothly coordinated synthesis of information among many different areas of your brain.

How is information communicated and shared among these multiple brain regions? Even though we'll talk about brain centers and structures that are involved in different aspects of behavior, the best way to think of the brain is as an *integrated system.*

Many brain functions involve the activation of *neural pathways* that link different brain structures (Sporns, 2011a, b). Neural pathways are formed by groups of neuron cell bodies in one area of the brain that project their axons to other brain areas. These neural pathways form communication networks and circuits that link different brain areas. Mapping the information highways of the human brain is the ambitious goal of *The Human Connectome Project,* which is described in the Focus on Neuroscience on page 65.

The Dynamic Brain: Plasticity and Neurogenesis

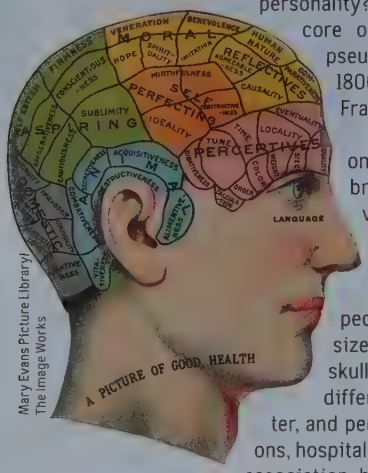
Before embarking on our tour, we need to describe one last important characteristic of the brain: its remarkable capacity to change in response to experience. Until the mid-1960s, neuroscientists believed—and taught—that by early adulthood the brain's physical structure was *hard-wired* or fixed for life (Raisman, 2004). But today it's known that the brain's physical structure is literally sculpted by experience (Knobloch & Jessberger, 2011). The brain's ability to change function and structure is referred to as *neuroplasticity,* or simply *plasticity* (Lledo & others, 2006). (The word *plastic* originally comes from a Greek word, *plastikos,* that meant the quality of being easily shaped or molded.)

> One of the great conceptual leaps of modern neuroscience has been the notion of neuroplasticity. . . . Scientists now know that even modest changes in the internal or external world can lead to structural changes in the brain.
>
> *BARRY L. JACOBS (2004)*

SCIENCE VERSUS PSEUDOSCIENCE

Phrenology: The Bumpy Road to Scientific Progress

Are people with large foreheads smarter than people with small foreheads? Does the shape of your head provide clues to your personality? Such notions were at the core of **phrenology**, a popular pseudoscience founded in the 1800s by German physician Franz Gall.



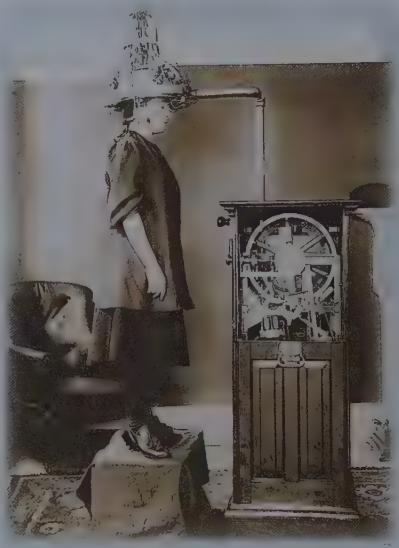
Mary Evans Picture Library/ The Image Works

After studying the anatomy of human and animal brains, Gall became convinced that the size and shape of the cortex were reflected in the size and shape of the skull. Suspecting that variations in the size and shape of the human skull might reflect individual differences in abilities, character, and personality, he went to prisons, hospitals, and schools to study the association between personal characteristics and any distinctive bulges or bumps on the person's skull. Eventually, Gall devised elaborate maps showing the location of the personality characteristics, or "faculties," that he believed were reflected in the shape of the head (see image).

When Gall's theory of phrenology was ridiculed by other scientists for lack of adequate evidence, Gall took his ideas to the general public. He lectured widely and gave "readings" in which he provided a personality description based on measuring the bumps on a person's head. Phrenology continued to be popular with both physicians and the general public well into the 1900s (Sokal & others, 2001). At the height of phrenology's popularity, some physicians even used leeches to drain blood from areas of the head that were believed to correspond to overdeveloped characteristics, such as "combativeness" or "amativeness" (McCoy, 2000).

Despite its pseudoscientific nature, phrenology helped advance the scientific study of the human mind and brain (Eghigian, 2011). It triggered scientific interest in the possibility of **cortical localization**, or *localization of function*—the idea that specific psychological and mental functions are located (or localized) in specific brain areas (Livianos-Aldano & others, 2007; van Wyhe, 2000).

Today, sophisticated brain-imaging techniques like fMRI and PET scans have demonstrated that some cognitive and perceptual abilities *are* localized in different brain areas. So although Franz Gall and the phrenologists were wrong about the significance of bumps on the skull, they were on target about the general idea of cortical localization.



M. James Nichols and William T. Newsome (1999, December 2). "The neurobiology of cognition." *Nature*, Vol. 402, no. 6761.

The Psycograph Henry Lavery invented the psycograph in the early 1900s to improve the accuracy of phrenology measurements. The machines stamped out brief summaries of the different "faculties" measured, such as: "You are fairly secretive but can improve." The machines were popular attractions in department stores and theater lobbies throughout the United States (McCoy, 1996, 2000).

phrenology (freh-NOL-uh-gee) A pseudoscientific theory of the brain that claimed that personality characteristics, moral character, and intelligence could be determined by examining the bumps on a person's skull.

cortical localization The notion that different functions are located or localized in different areas of the brain; also called *localization of function*.

functional plasticity The brain's ability to shift functions from damaged to undamaged brain areas.

structural plasticity The brain's ability to change its physical structure in response to learning, active practice, or environmental influences.

neurogenesis The development of new neurons.

One form of plasticity is **functional plasticity,** which refers to the brain's ability to shift functions from damaged to undamaged brain areas. Depending on the location and degree of brain damage, stroke or accident victims often need to "re-learn" once-routine tasks like speaking, walking, or reading. If the rehabilitation is successful, undamaged brain areas gradually assume the ability to process and execute the tasks (Pascual-Leone & others, 2005).

But the brain can do more than just shift functions from one area to another. **Structural plasticity** refers to the brain's ability to physically change its structure in response to learning, active practice, or environmental stimulation. It is now known that even subtle changes in your environment or behavior can lead to structural changes in the brain (Jacobs, 2004). In the Focus on Neuroscience, "Juggling and Brain Plasticity" on page 66, we describe an ingenious experiment that dramatically demonstrated structural plasticity in the human brain.

Neurogenesis

For many years, scientists believed that people and most animals did not experience **neurogenesis**—the development of new neurons—after birth (Gross, 2000; Kaplan, 2001). With the exception of birds, tree shrews, and some rodents, it was thought

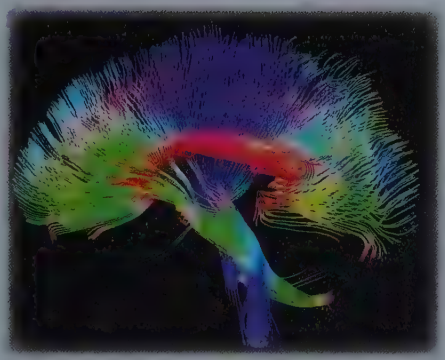
FOCUS ON NEUROSCIENCE

Mapping the Pathways of the Brain

The *Human Connectome Project* has an ambitious goal: to map the millions of miles of neural connections among the 100 billion neurons in the human brain (Sporns, 2011a, b). Launched in 2009 by the National Institutes of Health, the Human Connectome Project aims to combine brain-imaging data from hundreds of participants into a three-dimensional map of the brain's information highways (Williams, 2010).

A new brain-scanning technique called *diffusion spectrum imaging* (DSI) allows neuroscientists to produce three-dimensional images of the neural pathways that connect one part of the brain to another (Sporns, 2010; Wedeen & others, 2008). These pathways, sometimes called *tracts*, are made up of bundles of myelinated axons. DSI tracks the movement of water molecules in brain tissue along the axons.

To give you an idea of the complexity of the Connectome Project's task, imagine a one-millimeter cube of brain tissue about the size of a grain of sugar. To store the images needed to form a picture of all of the neural connections in this tiny cube of brain tissue would require one petrobyte—one million gigabytes—of computer memory. And to put *that* figure in perspective, one petrobyte is roughly the amount of data space that Facebook uses to store 40 billion photos (Vance, 2010).



TOM BARRICK, CHRIS CLARK, SGHMS/Photo Researchers

Each fiber in the photo represents hundreds of thousands of individual axons, which are too minuscule to be distinguished in a brain scan. Blue colors the bundled axons that form the neural pathway stretching from the top to the bottom of the brain. Green represents pathways from the front (left) to the back (right) of the brain. Red shows the *corpus callosum*, the pathway *between* the right and left brain hemispheres. (You'll read about the corpus callosum later in the chapter.)

Neuroscientists have become increasingly aware of the importance of the brain's network connections (Biswala & others, 2010). And, faulty network connections have been implicated in several brain disorders, including Alzheimer's disease, schizophrenia, and autism (Braskie & others, 2011; Lynall & others, 2010). It may be years before the findings of the Connectome Project yield practical applications, but even preliminary images, like the one shown here, reveal the dynamic intricacy of the most complex object in the universe—the human brain.

that the mature brain could lose neurons but could not grow new ones. But new studies offered compelling evidence that challenged that dogma (see Gould, 2007).

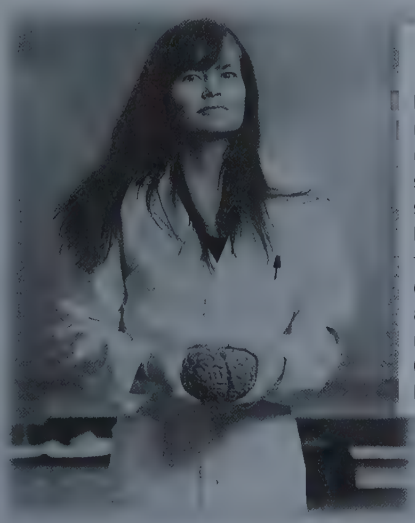
First, research by psychologist Elizabeth Gould and her colleagues (1998) showed that adult marmoset monkeys were generating a significant number of new neurons every day in the *hippocampus*, a brain structure that plays a critical role in the ability to form new memories. Gould's groundbreaking research provided the first demonstration that new neurons could develop in an adult primate brain. Could it be that the human brain also has the capacity to generate new neurons in adulthood?

"We've always known that our brains control our behavior, but not that our behavior could control and change the structure of our brains."

FRED GAGE (2007)

Researchers Peter Eriksson, Fred Gage, and their colleagues (1998) provided the first evidence that it does. The subjects were five adult cancer patients, whose ages ranged from the late fifties to the early seventies. These patients were all being given a drug used in cancer treatments to determine whether tumor cells are multiplying. The drug is incorporated into newly dividing cells, coloring them. Using fluorescent lights, this chemical tracer can be detected in the newly created cells. Eriksson and Gage reasoned that if new neurons were being generated, the drug would be present in their genetic material.

Within hours after each patient died, an autopsy was performed and the hippocampus was removed and examined. The results were unequivocal. In each patient, ***hundreds*** of new neurons had been generated since the drug had been administered, even though all the patients



Martin Schoeller/ Corbis Outline

Elizabeth Gould: Challenging Scientific Dogma While investigating the effect of stress hormones on rats, Gould found evidence of newly developed neurons in the rats' brains, a discovery that contradicted scientific understandings at that time. Her research eventually showed that neurogenesis takes place in the adult brains of many species. Today, Gould's research in her Princeton University lab focuses on the effects of stress, environmental deprivation and enrichment on the mammalian brain (Lehrer, 2006; Leuner & Gould, 2010). You can visit Gould's Princeton lab at: http://www.princeton.edu/~goulde/index.html

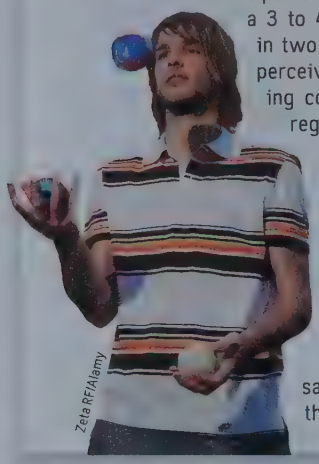
FOCUS ON NEUROSCIENCE

Juggling and Brain Plasticity

What happens to the brain when you learn a new, challenging skill? Does learning affect the brain's physical structure?

German researcher Bogdan Draganski and his colleagues (2004) showed that learning a new skill produces structural changes in the human brain. In their study, 24 young adults were assigned to either a "jugglers" or "nonjugglers" group. A baseline MRI scan indicated that there were no significant regional brain differences between the two groups at the beginning of the study.

Then the juggling group members were given three months to master a basic juggling routine. A second brain scan taken after this period indicated that the jugglers showed a 3 to 4 percent increase in gray matter in two brain regions that are involved in perceiving, remembering, and anticipating complex visual motions. These two regions are shown in yellow in the composite MRI scans shown on the right. In comparison, there were *no* brain changes in the scans of the nonjugglers over the same three-month period.

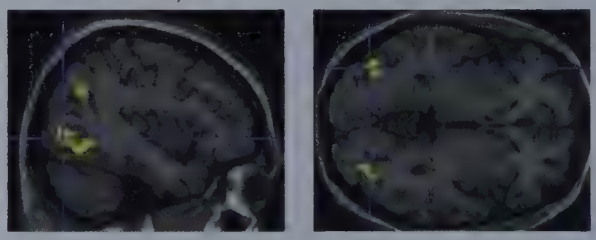


Zeta RF/Alamy

A third brain scan was performed three months after participants in the juggling group were told to stop practicing. Now, the same regions that had grown while the jugglers were practicing their skills every day had *decreased* in size. While still larger than before the participants had learned to juggle, the regions were 1 to 2 percent smaller than when the participants were juggling every day. In comparison, the same regions in the nonjuggling control group remained unchanged.

In a later study, novice jugglers showed changes in brain regions within just seven days after learning to juggle (Driemeyer & others, 2008). And, demonstrating the plasticity of even the aging brain, similar changes were found in a group of senior citizens after they learned to juggle (Boyke & others, 2008).

Courtesy of Dr. Arne May, *Nature*, 427, 311-312 (22 January 2004). Neuroplasticity: Changes in grey matter induced by training, Bogdan Draganski, Christian Gaser, Volker Busch, Gerhard Schuierer, Ulrich Boddahn, and Anne May.



Learning a New Skill Makes Its Mark on the Brain The yellow in these MRIs indicates the brain areas that temporarily increased by 3 to 4 percent in size in those participants who learned to juggle. These brain regions are involved in the ability to perceive, remember, and anticipate complex visual motions.

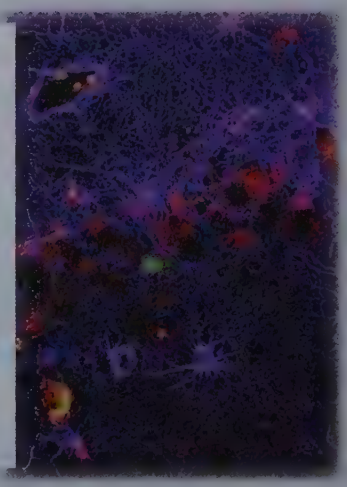


Photo courtesy Fred H. Gage, The Salk Institute, San Diego

Neurogenesis in the Adult Human Brain Using laser microscopes to examine sections of the adult hippocampus, researchers Peter Eriksson and Fred Gage (1998) documented the presence of new neurons, shown in green, amid already established neurons, shown in red. In the area of the hippocampus studied, each cubic centimeter of brain tissue contained from 100 to 300 new neurons. Research on adult mice has shown that the newly generated neurons develop into fully functional neurons that form synaptic connections with existing cells in the hippocampus (van Praag & others, 2002).

were over 50 years old (see accompanying photo). The conclusion? Contrary to the traditional scientific view, the human brain has the capacity to generate new neurons throughout the lifespan (Eriksson & others, 1998; Kempermann & Gage, 1999). These findings have been confirmed by later research (Curtis & others, 2011; Knobloch & Jessberger, 2011).

As new research on neurogenesis has exploded, new findings—and new questions— have arisen (Kempermann, 2011; Sahay & Hen, 2007). For example, Gould and her colleagues have found that new neurons develop and migrate to *multiple* brain regions in adult macaque monkeys (see Gould, 2007). Stress, exercise, environmental complexity, and even social status have been shown to affect the rate of neurogenesis in rodents, birds, and monkeys (see Gage & others, 2008). It is now generally accepted that newborn neurons develop into mature functioning neurons in at least two regions of the human brain—the hippocampus, involved in learning and memory, and the *olfactory bulb*, responsible for odor perception. And, it appears that these new neurons are incorporated into the existing neural networks in the adult human brain (Gage, 2003; Lledo & others, 2006).

In the next section, we'll begin our guided tour of the brain. Following the general sequence of the brain's development, we'll start with the structures at the base of the brain and work our way up to more complicated brain regions, which are responsible for complex mental activity.

The Brainstem

Hindbrain and Midbrain Structures

KEY THEME

› The brainstem includes the hindbrain and midbrain, located at the base of the brain.

KEY QUESTIONS

› Why does damage to one side of the brain affect the opposite side of the body?

› What are the key structures of the hindbrain and midbrain, and what are their functions?

brainstem A region of the brain made up of the hindbrain and the midbrain.

hindbrain A region at the base of the brain that contains several structures that regulate basic life functions.

medulla (meh-DOOL-uh) A hindbrain structure that controls vital life functions such as breathing and circulation.

The major regions of the brain are illustrated in Figure 2.14, which can serve as a map to keep you oriented during our tour. At the base of the brain lie the hindbrain and, directly above it, the midbrain. Combined, the structures of the hindbrain and midbrain make up the brain region that is also called the **brainstem.**

The Hindbrain

The **hindbrain** connects the spinal cord with the rest of the brain. Sensory and motor pathways pass through the hindbrain to and from regions that are situated higher up in the brain. Sensory information coming in from one side of the body crosses over at the hindbrain level, projecting to the opposite side of the brain. And outgoing motor messages from one side of the brain also cross over at the hindbrain level, controlling movement and other motor functions on the opposite side of the body. This is referred to as *contralateral organization.*

Contralateral organization accounts for why people who suffer strokes on one side of their brain experience muscle weakness or paralysis on the opposite side of their body. Our friend Asha, for example, suffered only minor damage to motor control areas in her brain. However, because the stroke occurred on the *left* side of her brain, what muscle weakness she did experience was localized on the *right* side of her body, primarily in her right hand.

Three structures make up the hindbrain—the medulla, the pons, and the cerebellum. The **medulla** is situated at the base of the brain directly above the spinal cord. It is at the level of the medulla that ascending sensory pathways and descending motor pathways crisscross to the contralateral side of the body.

The medulla plays a critical role in basic life-sustaining functions. It contains centers that control such vital autonomic functions as breathing, heart rate, and blood

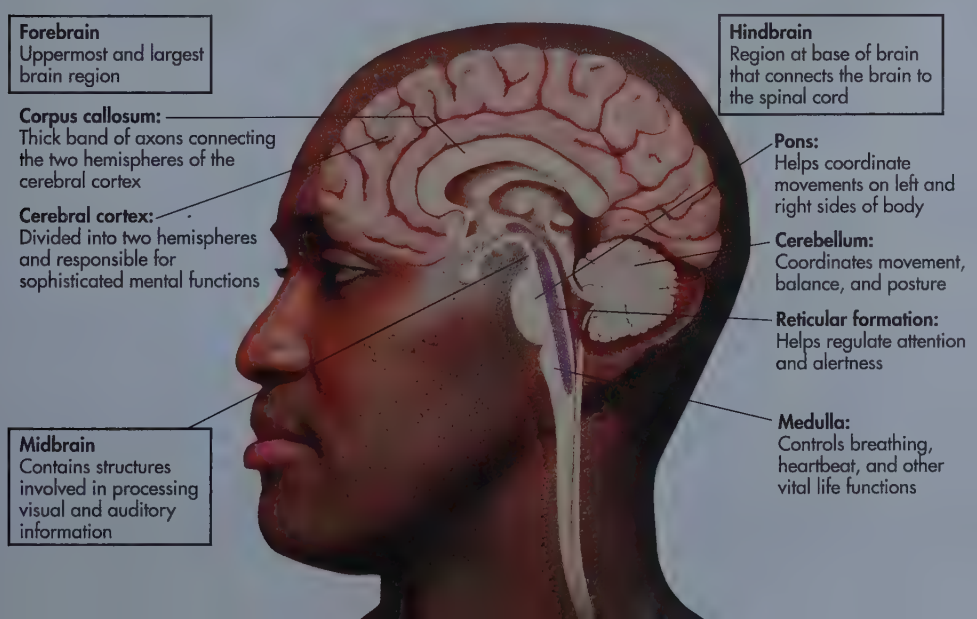


FIGURE 2.14 Major Regions of the Brain Situated at the base of the brain, the hindbrain's functions include coordinating movement and posture, regulating alertness, and maintaining vital life functions. The midbrain helps process sensory information. In combination, the hindbrain and the midbrain comprise the brainstem. The forebrain is the largest brain region and is involved in more sophisticated behaviors and mental processes.

pressure. The medulla also controls a number of vital reflexes, including swallowing, coughing, vomiting, and sneezing. Because the medulla is involved in such critical life functions, damage to this brain region can rapidly prove fatal.

Above the medulla is a swelling of tissue called the **pons,** which represents the uppermost level of the hindbrain. Bulging out behind the pons is the large **cerebellum.** On each side of the pons, a large bundle of axons connects it to the cerebellum. The word *pons* means "bridge," and the pons is a bridge of sorts: Information from various other brain regions located higher up in the brain is relayed to the cerebellum via the pons. The pons also contains centers that play an important role in regulating breathing.

The cerebellum functions in the control of balance, muscle tone, and coordinated muscle movements. It is also involved in the learning of habitual or automatic movements and motor skills, such as typing, writing, or backhanding a tennis ball.

Jerky, uncoordinated movements can result from damage to the cerebellum. Simple movements, such as walking or standing upright, may become difficult or impossible. The cerebellum is also one of the brain areas affected by alcohol consumption, which is why a person who is intoxicated may stagger and have difficulty walking a straight line or standing on one foot. (This is also why a police officer will ask a suspected drunk driver to execute these normally effortless movements.)

At the core of the medulla and the pons is a network of neurons called the **reticular formation,** or the *reticular activating system,* which is composed of many groups of specialized neurons that project up to higher brain regions and down to the spinal cord. The reticular formation plays an important role in regulating attention and sleep.

pons A hindbrain structure that connects the medulla to the two sides of the cerebellum; helps coordinate and integrate movements on each side of the body.

cerebellum (sare-uh-BELL-um) A large, two-sided hindbrain structure at the back of the brain; responsible for muscle coordination and maintaining posture and equilibrium.

reticular formation (reh-TICK-you-ler) A network of nerve fibers located in the center of the medulla that helps regulate attention, arousal, and sleep; also called the *reticular activating system.*

The Midbrain

The **midbrain** is an important relay station that contains centers involved in the processing of auditory and visual sensory information. Auditory sensations from the left and right ears are processed through the midbrain, helping you orient toward the direction of a sound. The midbrain is also involved in processing visual information, including eye movements, helping you visually locate objects and track their movements. After passing through the midbrain level, auditory and visual information is relayed to sensory processing centers farther up in the forebrain region, which will be discussed shortly.

A midbrain area called the **substantia nigra** is involved in motor control and contains a large concentration of dopamine-producing neurons. *Substantia nigra* means "dark substance," and as the name suggests, this area is darkly pigmented. The substantia nigra is part of a larger neural pathway that helps prepare other brain regions to initiate organized movements or actions. In the section on neurotransmitters, we noted that Parkinson's disease involves symptoms of abnormal movement, including difficulty initiating or starting a particular movement. Many of those movement-related symptoms are associated with the degeneration of dopamine-producing neurons in the substantia nigra.

midbrain The middle and smallest brain region, involved in processing auditory and visual sensory information.

substantia nigra (sub-STAN-she-uh NYE-gruh) An area of the midbrain that is involved in motor control and contains a large concentration of dopamine-producing neurons.

The Forebrain

KEY THEME

› The forebrain includes the cerebral cortex and the limbic system structures.

KEY QUESTIONS

› What are the four lobes of the cerebral cortex and their functions?

› What is the limbic system?

› What functions are associated with the thalamus, hypothalamus, hippocampus, and amygdala?

Situated above the midbrain is the largest region of the brain: the **forebrain.** In humans, the forebrain represents about 90 percent of the brain. In Figure 2.15, you can see how the size of the forebrain has increased during evolution, although the general structure of the human brain is similar to that of other species (Clark & others, 2001). Many important structures are found in the forebrain region, but we'll begin by describing the most prominent—the cerebral cortex.

forebrain The largest and most complex brain region, which contains centers for complex behaviors and mental processes; also called the *cerebrum.*

cerebral cortex (suh-REE-brull or SARE-uh-brull) The wrinkled outer portion of the forebrain, which contains the most sophisticated brain centers.

cerebral hemispheres The nearly symmetrical left and right halves of the cerebral cortex.

corpus callosum A thick band of axons that connects the two cerebral hemispheres and acts as a communication link between them.

temporal lobe An area on each hemisphere of the cerebral cortex near the temples that is the primary receiving area for auditory information.

occipital lobe (ock-SIP-it-ull) An area at the back of each cerebral hemisphere that is the primary receiving area for visual information.

parietal lobe (puh-RYE-et-ull) An area on each hemisphere of the cerebral cortex located above the temporal lobe that processes somatic sensations.

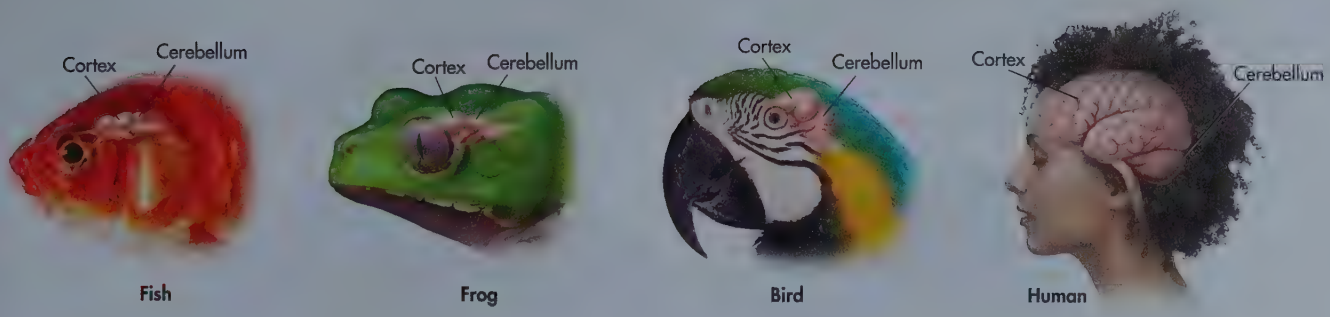


FIGURE 2.15 Evolution and the Cerebral Cortex The brains of these different animal species have many structures in common, including a cerebellum and cortex. However, the proportion devoted to the cortex is much greater in mammals than in species that evolved earlier, such as fish and amphibians. The relative size of the different structures reflects their functional importance (Kaas & Collins, 2001).

The Cerebral Cortex

The outer portion of the forebrain, the **cerebral cortex,** is divided into two **cerebral hemispheres.** The word *cortex* means "bark," and much like the bark of a tree, the cerebral cortex is the outer covering of the forebrain. A thick bundle of axons, called the **corpus callosum,** connects the two cerebral hemispheres, as shown in Figure 2.16. The corpus callosum serves as the primary communication link between the left and right cerebral hemispheres.

The cerebral cortex is only about a quarter of an inch thick. It is mainly composed of glial cells and neuron cell bodies and axons, giving it a grayish appearance—which is why the cerebral cortex is sometimes described as being composed of *gray matter.* Extending inward from the cerebral cortex are white myelinated axons that are sometimes referred to as *white matter.* These myelinated axons connect the cerebral cortex to other brain regions.

Numerous folds, grooves, and bulges characterize the human cerebral cortex. The purpose of these ridges and valleys is easy to illustrate. Imagine a flat, three-foot by three-foot piece of paper. You can compact the surface area of this piece of paper by scrunching it up into a wad. In much the same way, the grooves and bulges of the cerebral cortex allow about three square feet of surface area to be packed into the small space of the human skull.

Look again at Figure 2.14 on page 67. The drawing of the human brain is cut through the center to show how the cerebral cortex folds above and around the rest of the brain. In contrast to the numerous folds and wrinkles of the human cerebral cortex, notice the smooth appearance of the cortex in fish, amphibians, and birds in Figure 2.15. Mammals with large brains—such as cats, dogs, and nonhuman primates—also have wrinkles and folds in the cerebral cortex, but to a lesser extent than humans (Jarvis & others, 2005).

Each cerebral hemisphere can be roughly divided into four regions, or *lobes:* the *temporal, occipital, parietal,* and *frontal lobes* (see Figure 2.17 on the next page). Each lobe is associated with distinct functions. Located near your temples, the **temporal lobe** contains the *primary auditory cortex,* which receives auditory information. At the very back of the brain is the **occipital lobe.** The occipital lobe includes the *primary visual cortex,* where visual information is received.

The **parietal lobe** is involved in processing bodily, or *somatosensory,* information, including touch, temperature, pressure, and information from receptors in the muscles and joints. A band of tissue on the parietal lobe, called the *somatosensory cortex,* receives information from touch receptors in different parts of the body.

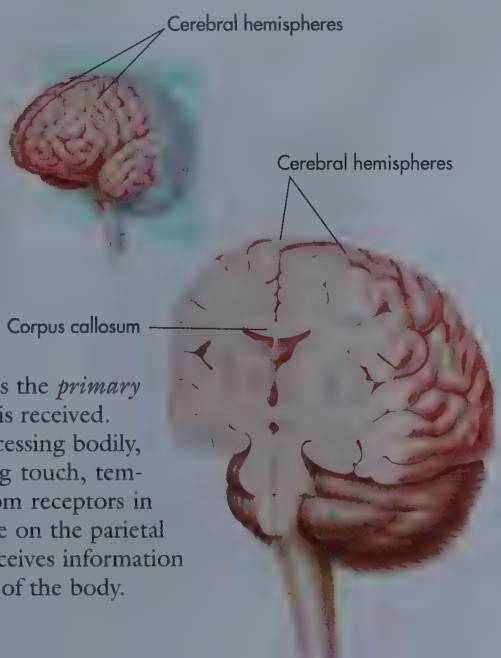


FIGURE 2.16 The Cerebral Hemispheres and the Corpus Callosum The two hemispheres of the cerebral cortex can be clearly seen in this side-to-side cross-sectional view of the brain. The main communications link connecting the two cerebral hemispheres is the corpus callosum, a thick, broad bundle of some 300 million myelinated neuron axons. The corpus callosum is often described as a C-shaped brain structure, which is depicted more clearly in Figure 2.14.

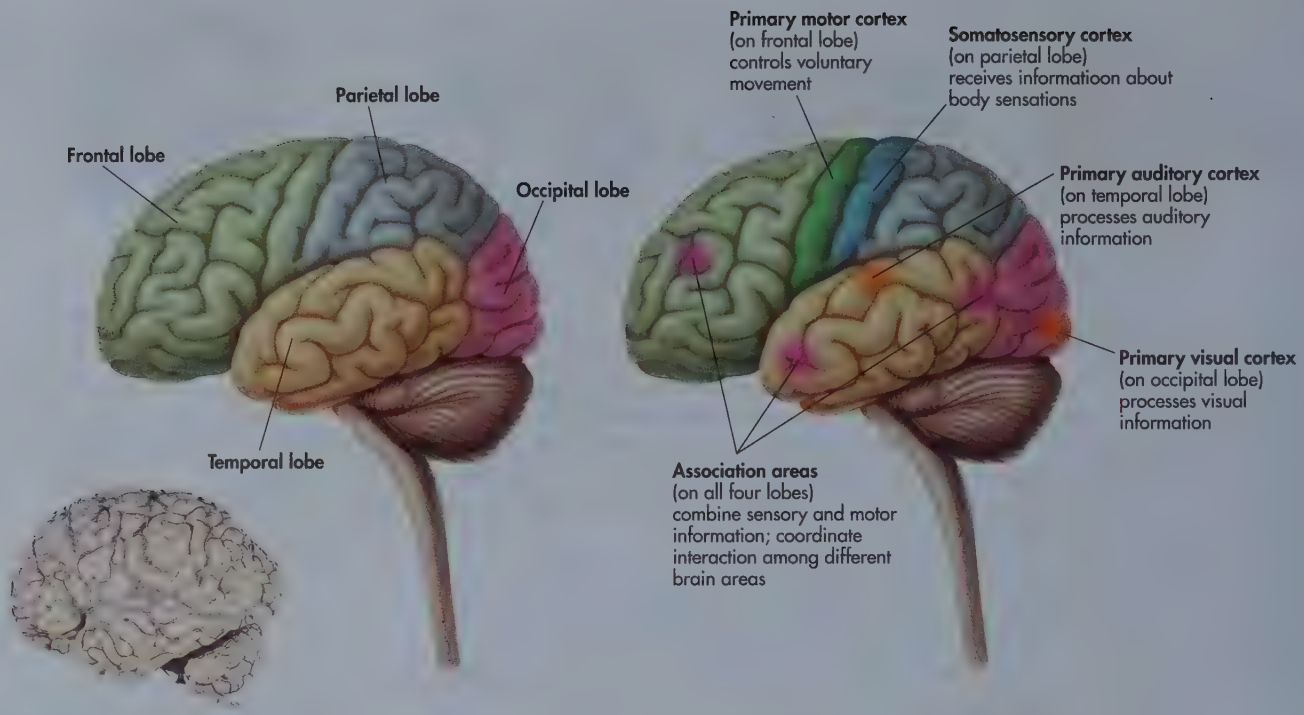


FIGURE 2.17 Lobes of the Cerebral Cortex Each hemisphere of the cerebral cortex can be divided into four regions, or *lobes*. Each lobe is associated with distinct functions. The association areas, shaded in purple, make up most of the cerebral cortex.

Each part of the body is represented on the somatosensory cortex, but this representation is not equally distributed (see Figure 2.18). Instead, body parts are represented in proportion to their sensitivity to somatic sensations. For example, on the left side of Figure 2.18 you can see that your hands and face, which are very responsive to touch, have much greater representation on the somatosensory cortex than do the backs of your legs, which are far less sensitive to touch.

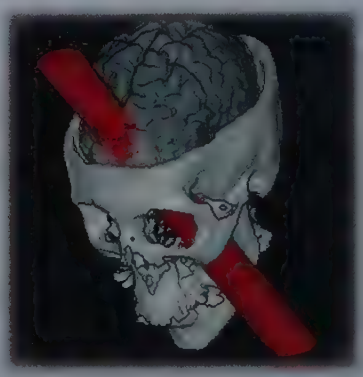
The **frontal lobe** is the largest lobe of the cerebral cortex, and damage to this area of the brain can affect many different functions. The frontal lobe is involved in planning, initiating, and executing voluntary movements. The movements of different body parts are represented in a band of tissue on the frontal lobe called the primary motor cortex. The degree of representation on the *primary motor cortex* for a particular body part reflects the diversity and precision of its potential movements, as shown on the right side of Figure 2.18. Thus, it's not surprising that almost one-third of the primary motor cortex is devoted to the hands and another third is devoted to facial muscles. The disproportionate representation of these two body areas on the primary motor cortex is reflected in the human capacity to produce an extremely wide range of hand movements and facial expressions.

The Famous Case of Phineas Gage Early interest in the importance of the frontal lobes was sparked by the famous case of Phineas Gage, a railroad foreman who suffered a horrendous accident in 1848 (Macmillan, 2000). A freak explosion shot a 3-foot-long iron bar through Gage's skull, piercing his brain and exiting out the top of his head. Gage miraculously recovered, but after the accident the formerly conscientious and soft-spoken foreman became bad-tempered, irresponsible, stubborn, and profane. Gage is shown here holding the iron bar.

After Gage's death in 1861, his physician, John Harlow, proposed that Gage's personality changes were caused by damage to his frontal lobes (Harlow, 1868). More than a century later, neuroscientists Hanna and Antonio Damasio (1994) used computerized modeling to create a three-dimensional model of Gage's injury (right) and confirmed that the injury had indeed damaged the frontal lobes. They also noted that the behavioral changes demonstrated by Gage fit the pattern seen in patients with frontal lobe damage, such as poor emotional control and an inability to make rational decisions.



Public Domain



Damasio, H., Grabowski, T., Frank, R., Galaburda, A.R., Damasio, A.R., "The return of Phineas Gage: Clues about the brain from the skull of a famous patient," *Science*, 264:1102–1105, 1994

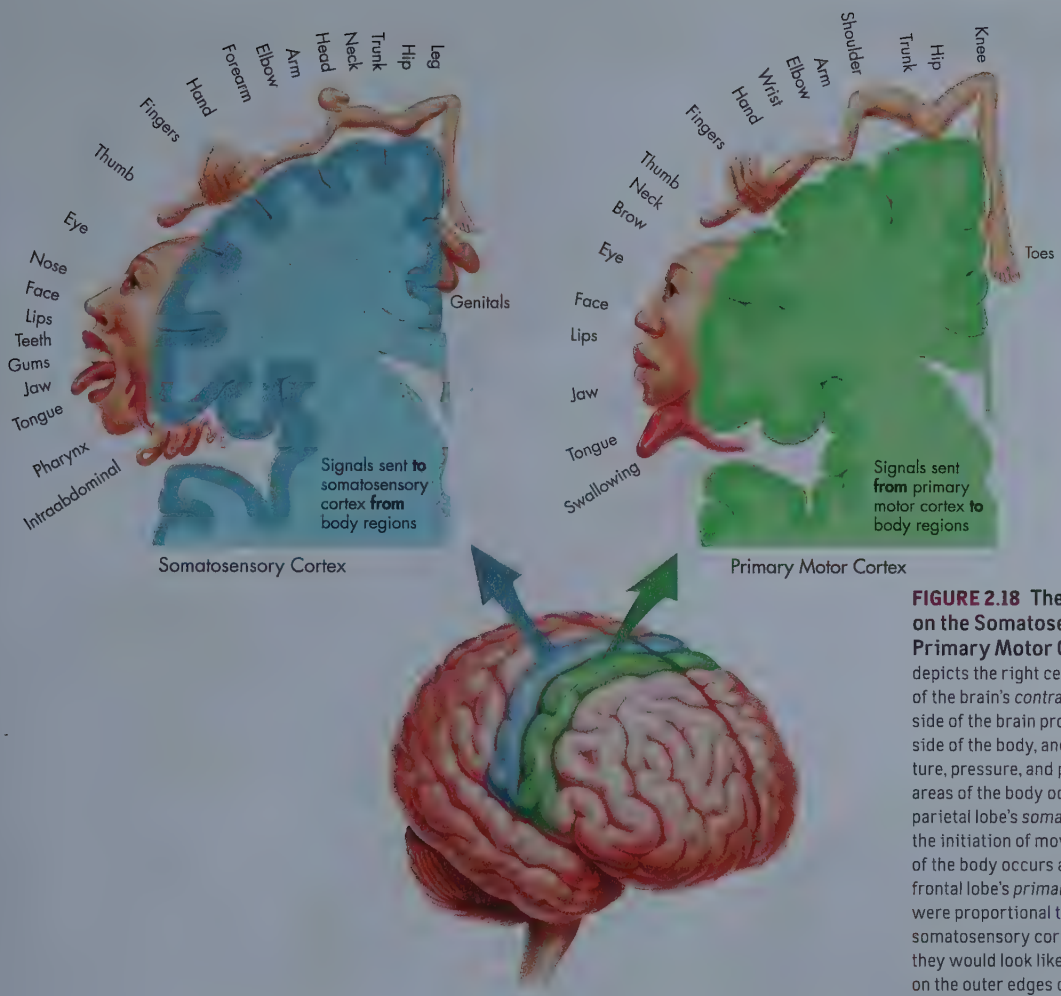


FIGURE 2.18 The Body's Representation on the Somatosensory Cortex and the Primary Motor Cortex This illustration depicts the right cerebral hemisphere. Because of the brain's *contralateral organization*, the right side of the brain processes functions for the left side of the body, and vice versa. Touch, temperature, pressure, and pain sensations for different areas of the body occur at distinct locations on the parietal lobe's *somatosensory cortex*. Similarly, the initiation of movement for different parts of the body occurs at distinct locations on the frontal lobe's *primary motor cortex*. If body parts were proportional to their representation on the somatosensory cortex and primary motor cortex, they would look like the misshapen human figures on the outer edges of the drawings.

The primary sensory and motor areas found on the different lobes represent just a small portion of the cerebral cortex. The remaining bulk of the cerebral cortex consists mostly of three large *association areas*. These areas are generally thought to be involved in processing and integrating sensory and motor information. For example, the *prefrontal association cortex*, situated in front of the primary motor cortex, is involved in the planning of voluntary movements. Another association area includes parts of the temporal, parietal, and occipital lobes. This association area is involved in the formation of perceptions and in the integration of perceptions and memories.

The Limbic System

Beneath the cerebral cortex are several other important forebrain structures, which are components of the **limbic system.** The word *limbic* means "border," and as you can see in Figure 2.19 on the next page, the structures that make up the limbic system form a border of sorts around the brainstem. In various combinations, the limbic system structures form complex neural circuits that play critical roles in learning, memory, and emotional control.

Let's briefly consider some of the key limbic system structures and the roles they play in behavior.

The Hippocampus The **hippocampus** is a large structure embedded in the temporal lobe in each cerebral hemisphere (see Figure 2.19). The word *hippocampus* comes from a Latin word meaning "sea horse." If you have a vivid imagination, the hippocampus

frontal lobe The largest lobe of each cerebral hemisphere; processes voluntary muscle movements and is involved in thinking, planning, and emotional control.

limbic system A group of forebrain structures that form a border around the brainstem and are involved in emotion, motivation, learning, and memory.

hippocampus A curved forebrain structure that is part of the limbic system and is involved in learning and forming new memories.

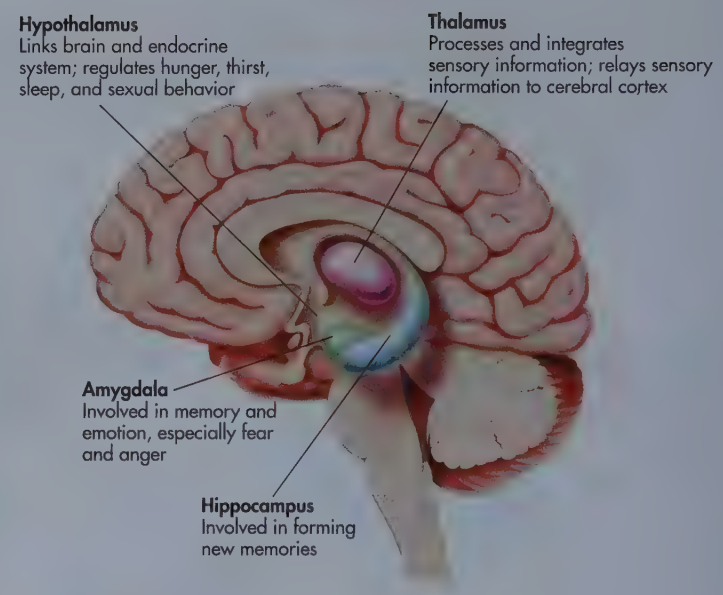


FIGURE 2.19 Key Structures of the Forebrain and Limbic System In the cross-sectional view shown here, you can see the locations and functions of four important subcortical brain structures. In combination, these structures make up the *limbic system*, which regulates emotional control, learning, and memory.

does look a bit like the curved tail of a sea horse. The hippocampus plays an important role in your ability to form new memories of events and information. As noted earlier, neurogenesis takes place in the adult hippocampus. The possible role of new neurons in memory formation is an active area of neuroscience research (see Gould, 2007; Lledo & others, 2006). In Chapter 6, we'll take a closer look at the role of the hippocampus and other brain structures in memory.

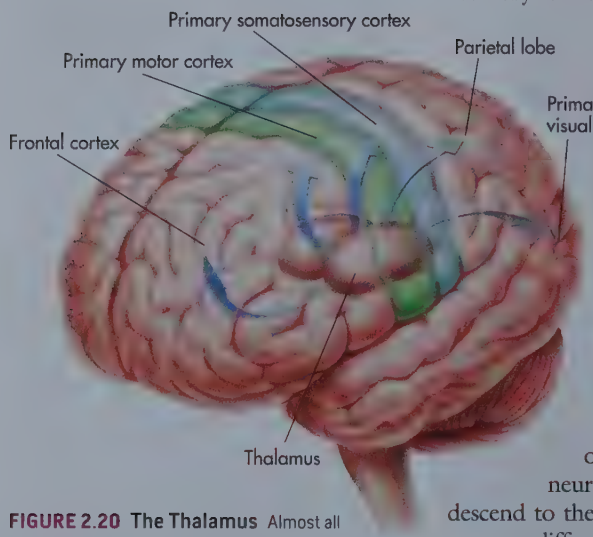


FIGURE 2.20 The Thalamus Almost all sensory and motor information going to and from the cerebral cortex is processed through the thalamus. This figure depicts some of the neural pathways from different regions of the thalamus to specific lobes of the cerebral cortex.

The Thalamus The word *thalamus* comes from a Greek word meaning "inner chamber." And indeed, the **thalamus** is a rounded mass of cell bodies located within each cerebral hemisphere. The thalamus processes and distributes motor information and sensory information (except for smell) going to and from the cerebral cortex. Figure 2.20 depicts some of the neural pathways going from the thalamus to the different lobes of the cerebral cortex. However, the thalamus is more than just a sensory relay station. The thalamus is also thought to be involved in regulating levels of awareness, attention, motivation, and emotional aspects of sensations.

The Hypothalamus *Hypo* means "beneath" or "below." As its name implies, the **hypothalamus** is located below the thalamus. Although it is only about the size of a peanut, the hypothalamus contains more than 40 neural pathways. These neural pathways ascend to other forebrain areas and descend to the midbrain, hindbrain, and spinal cord. The hypothalamus is involved in so many different functions, it is sometimes referred to as "the brain within the brain."

The hypothalamus regulates both divisions of the autonomic nervous system, increasing and decreasing such functions as heart rate and blood pressure. It also helps regulate a variety of behaviors related to survival, such as eating, drinking, frequency of sexual activity, fear, and aggression.

One area of the hypothalamus, called the *suprachiasmatic nucleus* (SCN), plays a key role in regulating daily sleep–wake cycles and other rhythms of the body. We'll take a closer look at the SCN in Chapter 4.

The hypothalamus exerts considerable control over the secretion of endocrine hormones by directly influencing the pituitary gland. The *pituitary gland* is situated just below the hypothalamus and is attached to it by a short stalk. The hypothalamus produces both neurotransmitters and hormones that directly affect the pituitary gland. As we noted in the section on the endocrine system, the pituitary gland releases hormones that influence the activity of other glands.

The Amygdala The **amygdala** is an almond-shaped clump of neuron cell bodies at the base of the temporal lobe. The amygdala is involved in a variety of emotional response patterns, including fear, anger, and disgust. Studies with animals have shown that electrical stimulation of the amygdala can produce these emotions. In contrast, destruction of the amygdala reduces or disrupts behaviors that are linked to fear and rage. For example, when their amygdala is destroyed, monkeys lose their fear of natural predators, such as snakes. In humans, electrical stimulation of the amygdala produces feelings of fear and apprehension. The amygdala is also involved in learning and forming memories, especially those with a strong emotional component (Phelps, 2006). In Chapters 6 and 8, we'll take a closer look at the amygdala's role in emotion.

thalamus (THAL-uh-muss) A forebrain structure that processes sensory information for all senses, except smell, and relays it to the cerebral cortex.

hypothalamus (hi-poe-THAL-uh-muss) A peanut-sized forebrain structure that is part of the limbic system and regulates behaviors related to survival, such as eating, drinking, and sexual activity.

amygdala (uh-MIG-dull-uh) Almond-shaped cluster of neurons in the brain's temporal lobe, involved in memory and emotional responses, especially fear.

cortical localization The notion that different functions are located or localized in different areas of the brain; also called *localization of function.*

Specialization in the Cerebral Hemispheres

KEY THEME

› Although they have many functions in common, the two hemispheres of the cerebral cortex are specialized for different tasks.

KEY QUESTIONS

› How did Broca, Wernicke, and Sperry contribute to our knowledge of the brain?

› Why would the corpus callosum be surgically severed and what effects would that produce?

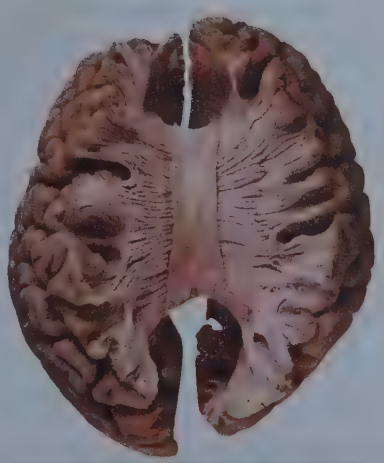
› How do the functions of the right and left cerebral hemispheres differ?

If you hold a human brain in your hand, the two cerebral hemispheres would appear to be symmetrical. Although the left and right hemispheres are very similar in appearance, they are not identical. Anatomically, one hemisphere may be slightly larger than the other. There are also subtle differences in the sizes of particular structures, in the distribution of gray matter and white matter, and in the patterns of folds, bulges, and grooves that make up the surface of the cerebral cortex.

What about differences in the functions of the two hemispheres? In many cases, the functioning of the left and right hemispheres is symmetrical, meaning that the same functions are located in roughly the same places on each hemisphere. Examples of such functional symmetry include the primary motor cortex and the somatosensory cortex, which we discussed in the previous section. With regard to other important processes, however, the left and right cerebral hemispheres do differ—each cerebral hemisphere is specialized for particular abilities.

Here's a rough analogy. Imagine two computers that are linked through a network. One computer is optimized for handling word processing, the other for handling graphic design. Although specialized for different functions, the two computers actively share information and can communicate with each other across the network. In this analogy, the two computers correspond to the left and right cerebral hemispheres, and the network that links them is the corpus callosum.

As you'll see in this section, the first discoveries about the differing abilities of the two brain hemispheres were made more than a hundred years ago by two important pioneers in brain research, Pierre Broca and Karl Wernicke.



Courtesy of Terence Williams, University of Texas

The Corpus Callosum Brain tissue from the top of the brain has been cut away to expose the thick fibers of the corpus callosum, the structure that connects the left and right hemispheres of the brain. Cutting the corpus callosum eliminates the transfer of information between the two hemispheres.

Language and the Left Hemisphere

The Early Work of Broca and Wernicke

By the end of the 1700s it had already been well established that injury to one side of the brain could produce muscle paralysis or loss of sensation on the opposite side of the body. By the early 1800s, animal experiments had shown that specific functions would be lost if particular brain areas were destroyed. And, as discussed in the Science Versus Pseudoscience box on page 64, phrenology triggered scientific debates about **cortical localization,** or *localization of function*—the idea that particular brain areas are associated with specific functions.

CRITICAL THINKING

"His" and "Her" Brains?

Do the brains of men and women differ? And if so, do those differences cause them to "think differently," as headlines sometimes claim?

Media reports often refer to physiological sex differences as "innate," "biological," or "hard-wired." But even differences that are biological in origin are not necessarily fixed, permanent, or inevitable (Hyde, 2007). For example, brain development and function are affected by the sex hormones both before birth and throughout life (Jordan-Young, 2010). However, hormone levels themselves are strongly influenced by environmental factors, ranging from the food we eat to the stressful circumstances we experience. As we've emphasized throughout this chapter, brain function and structure are highly responsive to environmental influences (Flavell & Greenberg, 2008; McCarthy & Arnold, 2011).

Neuroscientists have identified a number of differences between male and female brains, such as structures that on the average tend to be slightly larger in one sex (Cahill, 2006). The following are the best-substantiated differences:

1. Men's brains tend to be larger than women's brains.
Even at birth, the male newborn has a larger brain, primarily because their skulls are also larger. (Gilmore & others, 2007).

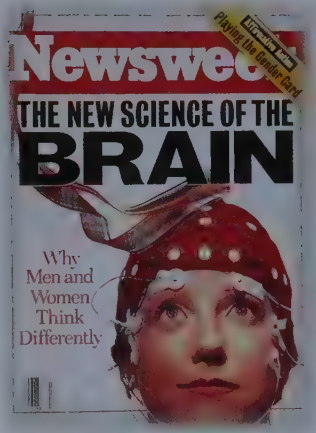
2. Women have a higher proportion of gray matter to white matter in their brains than men.
They also display greater *cortical complexity*, meaning that they have more folds, fissures, and wrinkles in their cerebral cortex (Luders & others, 2004).

Gray matter is also distributed differently in male and female brains. Males have a higher percentage of gray matter in their left hemisphere than in their right hemisphere. But in females, the distribution of gray and white matter is roughly equivalent in the left and right hemispheres. This observation leads to the next difference.

3. In general, the male brain is more asymmetrical and functions are more lateralized than in the female brain.
For example, women tend to rely on brain structures in both hemispheres for language tasks, while men are more reliant on one brain hemisphere, usually the left, for language tasks (Shaywitz & others, 1995; Cahill, 2006). Some brain-imaging studies have found that when it comes to solving complex arithmetic problems, spatial tasks, or mental rotation problems, males are more likely to rely on focused activation of specific brain regions in the right hemisphere. Females are more likely to draw upon multiple regions in *both* hemispheres to solve the same problems (Kucian & others, 2005; Grön & others, 2000).

So what does this mean? After an extensive review of research, Diane Halpern and her colleagues (2007) summarized the major anatomical and functional differences in this way: Male brains appear to be optimized for network connections *within* each hemisphere. Female brains appear to have better connections *between* the two hemispheres. The better communication between the left and right hemispheres gives females an advantage in language. Females also have a greater ability to integrate the left hemisphere's verbal-analytical processing with the right hemisphere's spatial and holistic mode of information processing.

However, not all structural differences lead to differences in measurable behaviors or abilities. In a series of studies, neuroscientist Jill Goldstein found that for several brain regions, the average size is slightly different in men and women (Goldstein, 2007; Goldstein & others, 2005). For example, the female hippocampus tends to be larger than the male hippocampus. But, when tested, memory skills were the *same*. As neuroscientist Geert J. De Vries (2004) points out, "Despite decades of research, we still do not know the functional significance of most sex differences in the brain."



Sex Differences and the Brain Subtle gender differences in brain function and structure make headlines. This headline implies that new discoveries about the brain will explain "why men and women think differently." How valid is this conclusion?

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Thinking Critically About Brain Differences

So do such findings support the belief that "men and women think differently"? Do they explain gender differences in cognitive abilities or personality traits? All the findings we've discussed need to be examined in the context of what is known—and, more importantly, what is *not* known—about the brain.

First, brain studies are typically based on small samples. Those samples may or may not be representative of the wider population of men and women. And while scientists are careful to qualify their conclusions and describe the limitations of their research, media reports rarely mention these qualifications.

Second, many sex differences amount to minor variations in a particular brain region. When differences are found, they are typically statistically significant differences in the amount or kind of tissue, such as the gender differences in gray matter distribution noted earlier. Even so, the basic brain structures are still the *same* in men and women.

Third, *every brain is different* to some degree (Gernsbacher, 2007a). Regardless of gender, no two brains are identical.

Finally, every brain is a "work in progress." Experience affects the brain, including the size of brain structures (McCarthy & Arnold, 2011). Thus, sex differences in structures or function might well be the *result* of the different life experiences of men and women, rather than the cause (Halpern & others, 2007; Jordan-Young, 2010).

CRITICAL THINKING QUESTIONS

- Why are sweeping claims about fundamental sex differences in the human brain misleading?
- What is wrong with the statement that certain behaviors or personality traits are "hard-wired" in the male or female brain?
- Why is the notion that sex differences might be due to brain differences so appealing to many people?

In the 1860s, more compelling evidence for cortical localization was presented by a French surgeon and neuroanatomist named **Pierre Paul Broca.** Broca treated a series of patients who had great difficulty speaking but could comprehend written or spoken language. Subsequent autopsies of these patients revealed a consistent finding—brain damage to an area on the *lower left frontal lobe.* Today, this area on the left hemisphere is referred to as *Broca's area,* and it is known to play a crucial role in speech production (Figure 2.21).

About a decade after Broca's discovery, a young German neurologist named **Karl Wernicke** discovered another area in the left hemisphere that, when damaged, produced a different type of language disturbance. Unlike Broca's patients, Wernicke's patients had great difficulty understanding spoken or written communications. They could speak quickly and easily, but their speech sometimes made no sense. They sometimes used meaningless words or even nonsense syllables, though their sentences seemed to be grammatical. In response to the question "How are you feeling?" a patient might say something like, "Don't glow glover. Yes, uh, ummm, bick, bo chipickers the dallydoe mick more work mittle." Autopsies of these patients' brains revealed consistent damage to an area on the *left temporal lobe* that today is called *Wernicke's area* (see Figure 2.21).



Paul Broca (1824–1880): Evidence for the Localization of Speech Paul Broca was already a famous scientist and surgeon when he announced in 1861 that he had discovered solid evidence for the localization of language functions in the human brain. His patient was an unpleasant middle-aged man universally known as Tan because that was the only word he could speak– aside from a single swear word when angered. Of normal intelligence, Tan could comprehend the speech of others but could not produce language himself. After Tan's death, an autopsy revealed a distinct lesion on the lower left frontal lobe. This area is still known as *Broca's area.*

National Library of Medicine Collection

The discoveries of Broca and Wernicke provided the first compelling clinical evidence that language and speech functions are performed primarily by the left cerebral hemisphere. If similar brain damage occurs in the exact same locations on the *right* hemisphere, these severe disruptions in language and speech are usually *not* seen.

The notion that one hemisphere exerts more control over or is more involved in the processing of a particular psychological function is termed **lateralization of function.** Speech and language functions are *lateralized* on the left hemisphere. Generally, the left hemisphere exerts greater control over speech and language abilities in virtually all right-handed and the majority of left-handed people.

The language disruptions demonstrated by Broca's and Wernicke's patients represent different types of aphasia. **Aphasia** refers to the partial or complete inability to articulate ideas or understand spoken or written language because of brain injury or damage. There are many different types of aphasia.

People with *Broca's aphasia* find it difficult or impossible to produce speech, which is why it is often referred to as *expressive aphasia.* Despite their impairments in speaking, their comprehension of verbal or written words is relatively unaffected.

People with *Wernicke's aphasia* have great difficulty comprehending written or spoken communication, which is why it is often referred to as *receptive aphasia.* Although they can speak, they often have trouble finding the correct words.

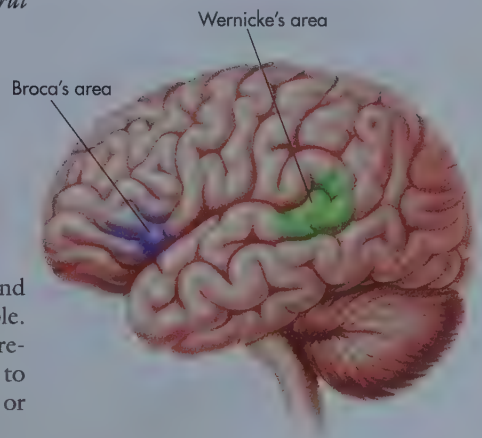
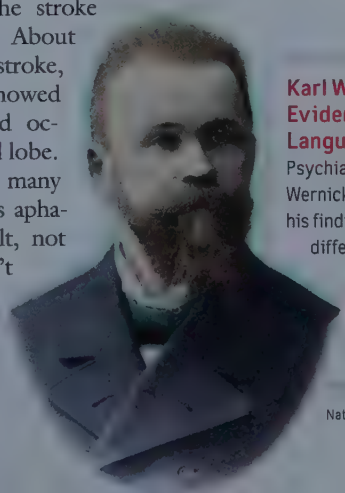


FIGURE 2.21 Broca's and Wernicke's Areas of the Cerebral Cortex Broca's area, located in the lower frontal lobe, is involved in the production of speech. Wernicke's area, found in the temporal lobe, is important in the comprehension of written or spoken language. Damage to either of these areas will produce different types of speech disturbances, or aphasia. In most people, both areas are found on the left hemisphere.

At the beginning of this chapter, we described the symptoms experienced by our friend Asha in the weeks before and the months following her stroke. Asha, who is right-handed, experienced the stroke in her left hemisphere. About three days after her stroke, an MRI brain scan showed where the damage had occurred: the left temporal lobe.

Asha experienced many symptoms of Wernicke's aphasia. Talking was difficult, not because Asha couldn't speak, but because she had to stop frequently to search for the right words. Asha



Karl Wernicke (1848–1905): Evidence for the Localization of Language Comprehension Psychiatrist and neurologist Karl Wernicke was only 26 when he published his findings on a type of aphasia that differed from that identified by Paul Broca. Wernicke's patients were unable to comprehend written or spoken language, although they could produce speech.

National Library of Medicine Collection

lateralization of function The notion that specific psychological or cognitive functions are processed primarily on one side of the brain.

aphasia (uh-FAZE-yuh) The partial or complete inability to articulate ideas or understand spoken or written language because of brain injury or damage.

Both: Courtesy of Dr. William Hopkins





Left-Handed Orangutans and Right-Handed Chimpanzees Like humans, many animals also display a preference for one hand or paw. Even fish display a preference for a right eye or left eye to look at novel objects (Brown & others, 2007). Unlike humans, who are predominantly right-handed, animals tend to vary by species, population, and task (Hopkins & Cantalupo, 2005). For example, orangutans, like the one shown in the left photo, tend to be left-handed (Hopkins, 2006). Chimpanzees are more likely to be right-handed, especially when raised in captivity. One recent study found that chimpanzees who are strongly right-handed tend to have more asymmetrical brain hemispheres than chimpanzees who use both hands for tools and simple reaching tasks (Hopkins & others, 2007).

was unable to name even simple objects, like the cup on her hospital dinner tray or her doctor's necktie. She recognized the objects but was unable to say what they were. She had great difficulty following a normal conversation and understanding speech, both in English and in her native language, Tulu.

Asha also discovered that she had lost the ability to read. She could see the words on the page, but they seemed to have no meaning. Her husband, Paul, brought some of their Christmas cards to the hospital. Asha recalls, "When I realized I couldn't read the Christmas cards, I thought my life was over. I just lost it. I remember crying and telling the nurse, 'I have a doctorate and I can't read, write, or talk!' "

When we visited Asha in the hospital, we brought her a Christmas present: a portable music player with headphones and some albums of relaxing instrumental music. Little did we realize how helpful the music would be for her. One album was a recording of Native American flute music called *Sky of Dreams*. The music was beautiful and rather unusual, with intricate melodies and unexpected, complex harmonies. Although it was very difficult for Asha to follow normal speech, listening to *Sky of Dreams* was an entirely different experience. As Asha explained:

> I tried cranking up the music very high and it soothed me. I could sleep. At the time, the flute music seemed to be just perfectly timed with the way my brain was working. It was tuning out all the other noises so I could focus on just one thing and sleep. So I would play the music over and over again at a very high level. I did that for a long time because my mind was so active and jumbled that I couldn't think.

Asha's language functions were severely disrupted, yet she was able to listen to and appreciate instrumental music—even very complex music. Why? At the end of the next section, we'll offer a possible explanation for what seems to have been a disparity in Asha's cognitive abilities following her stroke.

Cutting the Corpus Callosum

The Split Brain

Since the discoveries by Broca and Wernicke, the most dramatic evidence illustrating the independent functions of the two cerebral hemispheres has come from a surgical procedure called the **split-brain operation.** This operation is used to stop or reduce recurring seizures in severe cases of epilepsy that can't be treated in any other fashion. The procedure involves surgically cutting the corpus callosum, the thick band of axons that connects the two hemispheres.

What was the logic behind cutting the corpus callosum? An epileptic seizure typically occurs when neurons begin firing in a disorganized fashion in one region of the brain. The disorganized neuronal firing quickly spreads from one hemisphere to the other via the corpus callosum. If the corpus callosum is cut, seizures should be contained in just one hemisphere, reducing their severity or eliminating them altogether. This is exactly what happened when the split-brain operation was first tried in this country in the 1940s (Springer & Deutsch, 1998).

Surprisingly, cutting the corpus callosum initially seemed to produce no noticeable effect on the patients, other than reducing their epileptic seizures. Their ability to engage in routine conversations and tasks seemed to be unaffected. On the basis of these early observations, some brain researchers speculated that the corpus callosum served no function whatsoever (Gazzaniga, 1995). One famous psychologist, Karl

split-brain operation A surgical procedure that involves cutting the corpus callosum.

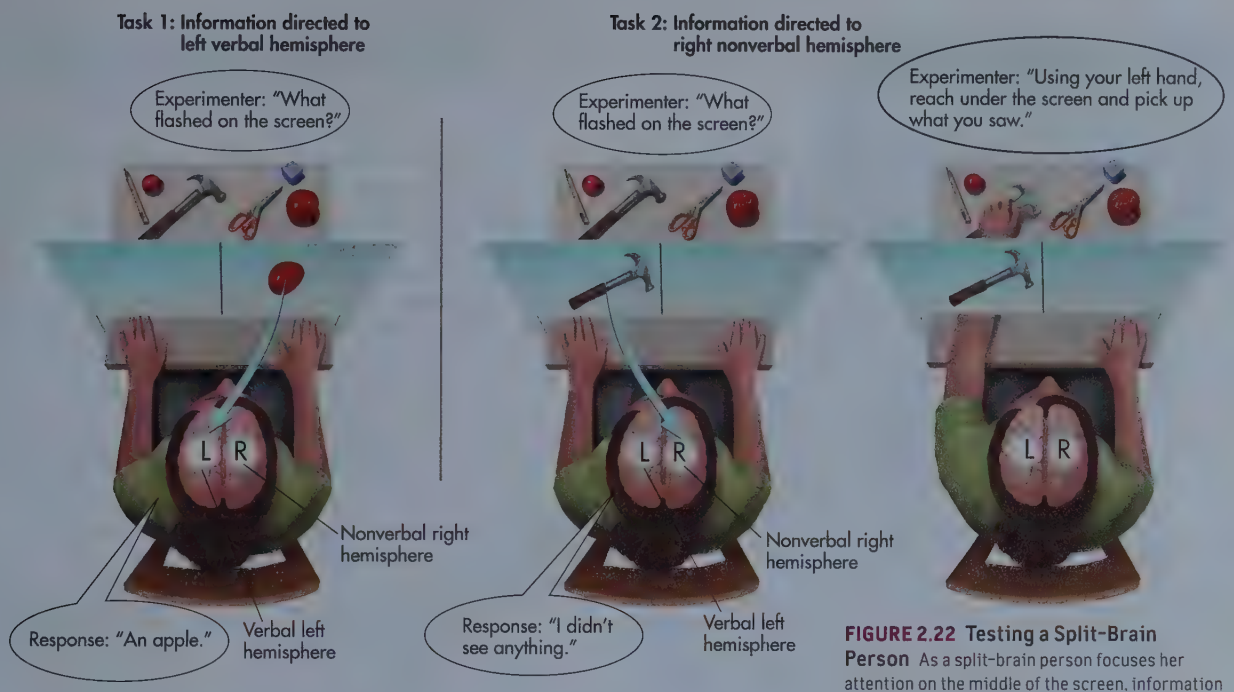


FIGURE 2.22 Testing a Split-Brain Person As a split-brain person focuses her attention on the middle of the screen, information is briefly flashed to either the left or right side of the midpoint. In Task 1, information is flashed to her right visual field, sending it to her left verbal hemisphere. When asked about the information, she easily names it. In Task 2, information is directed to her left visual field, sending it to her right nonverbal hemisphere. When asked about the information, she is unable to verbally reply with the correct answer. But when asked to use her left hand, which is controlled by the same right nonverbal hemisphere that detected the flashed image, she is able to reach under the screen, feel the different objects, and pick up the correct one.

Lashley, joked that the primary function of the corpus callosum seemed to be to keep the two hemispheres from sagging (Hoptman & Davidson, 1994).

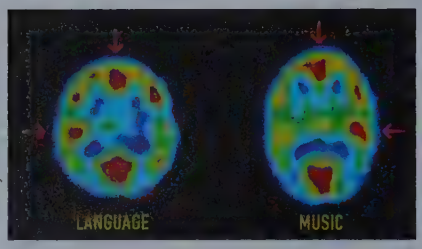
In the 1960s, however, psychologist and neuroscientist **Roger Sperry** and his colleagues began unraveling the puzzle of the left and right hemispheres. Sperry and his colleagues used the apparatus shown in Figure 2.22 to test the abilities of split-brain patients. They would direct a split-brain subject to focus on a point in the middle of a screen, while briefly flashing a word or picture to the left or right of the midpoint.

In this procedure, visual information to the right of the midpoint is projected to the person's *left* hemisphere, and visual information to the left of the midpoint is projected to the *right* hemisphere. Behind the screen several objects were hidden from the split-brain subject. The subject could reach under a partition below the screen to pick up the concealed objects but could not see them (Sperry, 1982).

In a typical experiment, Sperry projected the image of an object concealed behind the screen, such as a hammer, to the left of the midpoint. This is shown in Task 2, Figure 2.22. Thus, the image of the hammer was sent to the right, nonverbal hemisphere. If a split-brain subject was asked to *verbally* identify the image flashed on the screen, he could not do so and often denied that anything had appeared on the screen. Why? Because his verbal left hemisphere had no way of knowing the information that had been sent to his right hemisphere. However, if a split-brain subject was asked to use his left hand to reach under the partition for the object that had been displayed, he would correctly pick up the hammer. This was because his left hand was controlled by the same right hemisphere that saw the image of the hammer.

Sperry's experiments reconfirmed the specialized language abilities of the left hemisphere that Broca and Wernicke had discovered more than a hundred years earlier. But notice, even though the split-brain subject's right hemisphere could not express itself verbally, it still processed information and expressed itself *nonverbally:* The subject was able to pick up the correct object.

Over the last four decades, researchers have gained numerous insights about the brain's lateralization of functions by studying split-brain patients, using brain-imaging techniques with normal subjects, and employing other techniques (Gazzaniga, 2005). On the basis of this evidence, researchers have concluded that—in most people—the left hemisphere is superior in language abilities, speech, reading, and writing.



Dan McCoy/ Rainbow

Specialization in the Left and Right Hemispheres The red arrow at the top of each PET scan points to the front of the brain. The red and yellow colors indicate the areas of greatest brain activity. Listening to speech involves a greater degree of activation of the language areas of the left hemisphere. Listening to music involves more activation in right-hemisphere areas. Notice, however, that there is some degree of activity in both hemispheres during these tasks.

In contrast, the right hemisphere is more involved in nonverbal emotional expression and visual-spatial tasks (Corballis & others, 2002). Deciphering complex visual cues, such as completing a puzzle or manipulating blocks to match a particular design, also relies on right-hemisphere processing (Gazzaniga, 1995, 2005). And the right hemisphere excels in recognizing faces and emotional facial cues, reading maps, copying designs, and drawing. Finally, the right hemisphere shows a higher degree of specialization for musical appreciation or responsiveness—but not necessarily for musical ability, which involves the use of the left hemisphere as well (Springer & Deutsch, 2001).

Figure 2.23 summarizes the research findings for the different specialized abilities of the two hemispheres for right-handed people. As you look at the figure, it's important to keep two points in mind. First, the differences between the left and right hemispheres are almost always relative differences, *not* absolute differences. In other words, *both* hemispheres of your brain are activated to some extent as you perform virtually any task (Toga & Thompson, 2003). In the normal brain, the left and right hemispheres function in an integrated fashion, constantly exchanging information (Banich, 1998; Allen & others, 2007). Thus, Figure 2.23 indicates the hemisphere that typically displays greater activation or exerts greater control over a particular function. Misconceptions about the roles played by the left and right hemispheres are common in the popular media. The Science Versus Pseudoscience box, "Brain Myths," explores some of the most common misperceptions about the brain. Second, many functions of the cerebral hemispheres, such as those involving the primary sensory and motor areas, *are* symmetrical. They are located in the same place and are performed in the same way on both the left and the right hemisphere.

Given the basic findings on the laterality of different functions in the two hemispheres, can you speculate about why Asha was unable to read or follow a simple conversation but could easily concentrate on a complex piece of music? Why were her language abilities so disrupted, while her ability to focus on and appreciate music remained intact after her stroke?

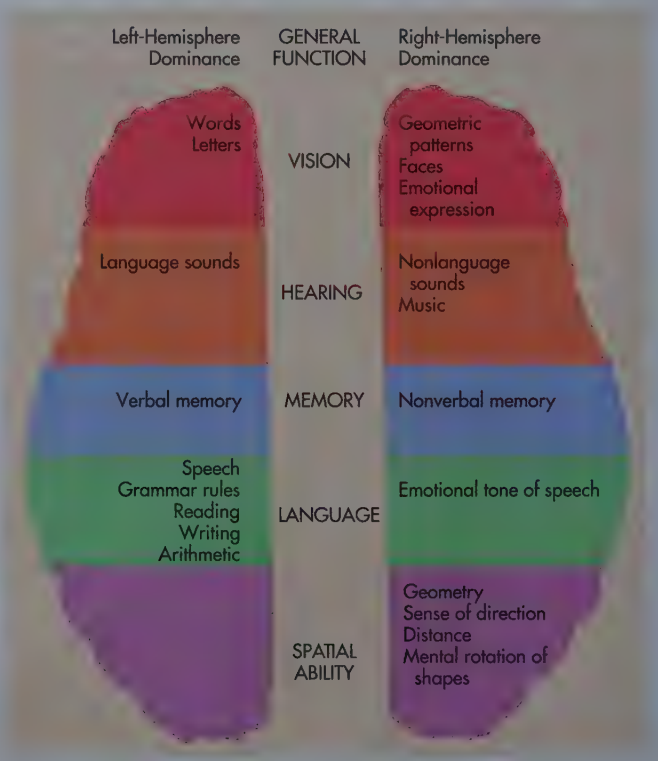


FIGURE 2.23 Specialized Abilities of the Two Hemispheres Most people are left-hemisphere dominant for speech and language tasks and right-hemisphere dominant for visual-spatial tasks. Although the hemispheres display some specialized abilities, many functions are symmetrical and performed the same way on both hemispheres.

SCIENCE VERSUS PSEUDOSCIENCE

Brain Myths

Is it true that we only use 10 percent of our brain?

Sorry, but this popular notion simply isn't true. Think about the information presented in this chapter. As brain-imaging techniques clearly show, multiple brain areas are activated in response to even simple tasks, such as speaking or listening to music. Further, if we used only 10 percent of our brain, then people who have a stroke or brain injury would probably not experience any obvious consequences. Of course, that's not what happens. There is *no* area of the brain that can be damaged without some kind of consequences. Finally, how well do you think you would function if a brain injury destroyed a "mere" 25 percent of your brain?

So where did the 10 percent myth come from?

The famous psychologist William James may have inadvertently contributed to the 10 percent myth when he wrote in 1908, "We are making use of only a small part of our possible mental and physical resources." Whether James contributed to the myth or not, the myth has been around since at least the early 1900s (Beyerstein, 1999). Some of those who perpetuate the 10 percent myth probably mean well, like teachers, coaches, and motivational speakers. Their basic message is that each of us should strive to reach our full potential. But you will *never* hear a neuroscientist make the 10 percent claim. As neuroscientist Barry Gordon comments, "We use virtually every part of the brain, and the brain is active almost all the time. Let's put it this way: the brain represents three percent of the body's weight and uses 20 percent of the body's energy" (quoted in Boyd, 2008).

Most right-handed people are strongly right-handed. Is the same true of lefties?

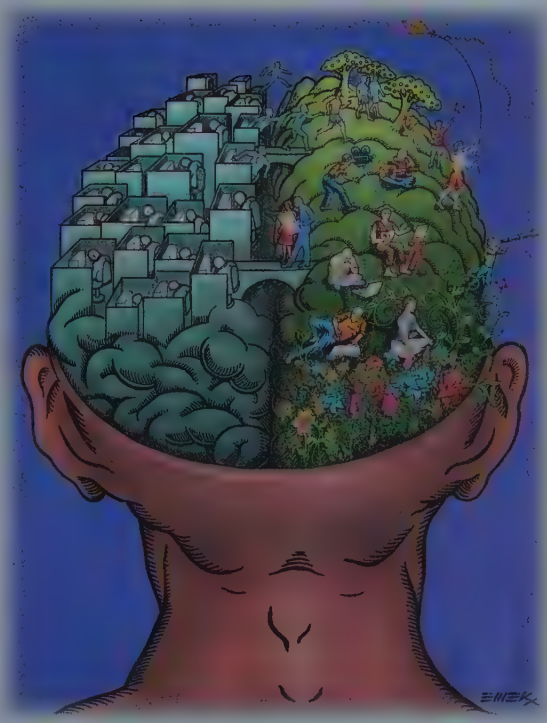
The vast majority of people are strongly right-handed, using their right hands for virtually all tasks requiring dexterity. About 10 to 13 percent of the population identify themselves as left-handed (Basso, 2007). But most left-handers actually show a pattern of mixed-handedness. For example, your author Don uses his left hand to write and hold a fork but his right hand to swing a tennis racquet and hammer nails. Strong left-handedness is extremely rare: only 2 or 3 percent of the population is strongly left-handed (Wolman, 2005).

Is it true that left-handed people process speech and language in their right cerebral hemisphere? Are they right-hemisphere dominant?

No. About 70 percent of left-handers are *left-hemisphere* dominant for language, just like the vast majority of right-handed people (Toga & Thompson, 2003). Only about 15 percent of left-handers are right-hemisphere dominant for language. Another 15 percent are bilateral, using *both* hemispheres for speech and language functions (Jörgens & others, 2007). Just for the record, about 3 percent of *right*-handed people are either *right*-hemisphere or bilaterally specialized for language.

Is it true that some people are "right-brained" and other people "left-brained"?

It certainly seems as if some people are more logical, analytical, or detail-oriented than others, especially in the way that they make decisions or tackle problems. However, in the normal, intact human brain, left and right hemispheres are highly interconnected. So, unless their corpus callosum has been surgically sliced, *all* humans rely on the smooth integrated functioning of *both* their left and right hemispheres to speak, learn, and generally navigate everyday life. In fact, the more complex the task, the greater the likelihood that *both* hemispheres will be involved in performing it (Allen & others, 2007; Yoshizaki & others, 2007). So, in that sense, the simple answer to this question is *no*.



Left Brain, Right Brain? As this image rather playfully suggests, many people see the two hemispheres as representing diametrically opposed ways of thinking and behaving: the left brain is cold, rational, and analytical; the right brain is emotional, artistic, and free-spirited. But how much truth is there to this myth?

Is the right brain responsible for creativity and intuition? Can you train your right brain?

Although the right hemisphere is specialized for holistic processing, there is no evidence that the right hemisphere is any more "intuitive" or "creative" than the left hemisphere (Gazzaniga, 2005). Nor is there evidence that any teacher, however skilled, could somehow selectively "educate" one side of your brain in isolation from the other (Goswami, 2006). While it is true that each hemisphere is specialized for different abilities, you rely on the integrated functioning of *both* hemispheres to accomplish most tasks. This is especially true for such cognitively demanding tasks as artistic creativity, musical performance, or finding innovative solutions to complex problems.

A plausible explanation has to do with the location of the stroke's damage on Asha's left temporal lobe. Because language functions are usually localized on the left hemisphere, the stroke produced serious disruptions in Asha's language abilities. However, her *right* cerebral hemisphere sustained no detectable damage. Because one of the right hemisphere's abilities is the appreciation of musical sounds, Asha retained the ability to concentrate on and appreciate music.

CONCEPT REVIEW 2.3

The Brain

Fill in the blanks in the following statements.

1. The three major regions of the brain are the _____, _____, and _____.
2. Coordinated muscle movements and balance are regulated by the _____.
3. Auditory information is processed in the _____ lobe.
4. The signals for voluntary movements originate in the _____, which is located on the _____ lobe.
5. The _____ plays a critical role in the formation of new memories.
6. The hypothalamus, hippocampus, amygdala, and parts of the thalamus and frontal cortex make up the _____.
7. Damage to _____ on the brain's left hemisphere disrupts the ability to speak but not the ability to understand spoken or written communication.
8. The _____ is surgically cut in the split-brain operation.
9. Our daily sleep–wake cycles are regulated by an area of the hypothalamus called the _____.



CLOSING THOUGHTS

In our exploration of neuroscience and behavior, we've traveled from the activities of individual neurons to the complex interaction of the billions of neurons that make up the human nervous system, most notably the brain. In the course of those travels, we presented four themes that are crucial to a scientific understanding of brain function: *localization*, *lateralization*, *integration*, and *plasticity*.

More than just a historical scientific oddity, phrenology's incorrect interpretation of bumps on the skull helped focus scientific debate on the notion of *localization*—the idea that different functions are localized in different brain areas. Although rejected in the early 1800s when Franz Gall was in his heyday, localization of brain functioning is well established today. The early clinical evidence provided by Broca and Wernicke, and the later split-brain evidence provided by Sperry and his colleagues, confirmed the idea of *lateralization*—that some functions are performed primarily by one cerebral hemisphere.

The ideas of localization and lateralization are complemented by another theme evident in this chapter—*integration*. Although the nervous system is highly specialized, even simple behaviors involve the highly integrated interaction of trillions of synapses. Your ability to process new information and experiences, your memories of previous experiences, your sense of who you are and what you know, your actions and reactions—all depend upon the harmony of the nervous system.

The story of Asha's stroke illustrated what can happen when that harmony is disrupted. Asha survived her stroke, but many people who suffer strokes do not. Of those who do survive a stroke, about one-third are left with severe impairments in their ability to function.

What happened to Asha? Fortunately, her story has a happy ending. Asha was luckier than many stroke victims—she was young, strong, and otherwise healthy. Asha's recovery was also aided by her high level of motivation, willingness to work hard, and sheer will to recover. After being discharged from the hospital, Asha began months of

intensive speech therapy. Her speech therapist assigned a great deal of homework that consisted of repeatedly pairing pictures with words, objects with words, and words with objects. Asha was literally rewiring her brain by relearning the correct associations between words and their meanings.

Asha set a very high goal for herself: to return to teaching at the university the following fall semester. With the help of her husband, Paul, and her mother, Nalini, who traveled from India to help coach her back to full recovery, Asha made progressive and significant gains. With remarkable determination, Asha reached the goal she had set for herself. Eight months after her stroke, she returned to the classroom and her research lab.



Asha's Recovery After leaving the hospital, Asha began retraining her brain with speech therapy. Asha's husband, Paul, and her mother, Nalini, helped her with the speech drills. Day after day, Asha repeatedly paired words with objects or identified numbers, weekdays, or months. As Asha gradually made progress, Nalini began taking her to stores. "She'd tell the clerk I was from India and that my English wasn't very good and ask them to please be patient with me. She basically forced me to talk to the sales clerks." Today, more than five years after the stroke, Asha has completely recovered and resumed teaching.

Bryn Alan

Today, more than five years after her stroke, the average person would never know that Asha had sustained significant brain damage. Other than an occasional tendency to "block" on familiar words—especially when she's very tired—Asha seems to have made a complete recovery.

Thus, Asha's story illustrates a final theme—the brain's remarkable *plasticity*. Next, we take a closer look at how the brain responds to different types of environments. You will also learn how you can use research to enhance your own dendritic potential!

ENHANCING WELL-BEING WITH PSYCHOLOGY

Maximizing Your Brain's Potential

It was 1962 when a group of neuroscientists led by psychologist Mark Rosenzweig published the unexpected finding that the brains of rats raised in *enriched environments* were significantly different from the brains of rats raised in *impoverished environments*.

For lab rats, an *enriched environment* is spacious, houses several rats, and has assorted wheels, ladders, tunnels, and objects to explore. The environment is also regularly changed for further variety. Some enriched environments have been designed to mimic an animal's natural environment (see Heyman, 2003). In the *impoverished environment*, a solitary rat lives in a small, bare laboratory cage with only a water bottle and food tray to keep it company.

Decades of research have shown that enrichment increases the number and length of dendrites and dendritic branches, increases the number of glial cells, and enlarges the size of neurons (Cohen, 2003). Enrichment produces more synaptic connections between brain neurons, while impoverishment decreases synaptic connections. With more synapses, the brain has a greater capacity to integrate and process information and to do so more quickly. In young rats, enrichment increases the number of synapses in the cortex by as much as 20 percent. But even the brains of extremely old rats respond to enriched environments. In fact, no matter what the age of the rats studied, environmental enrichment or impoverishment had a significant impact on brain structure (Kempermann & others, 1998).

Enrichment has also been shown to increase the rate of neurogenesis in many different species, from rodents to monkeys (Fan & others, 2007; Nithianantharajah & Hannan, 2006). Both the number and the survival time of new neurons increase in response to enrichment (Gould & Gross, 2002; van Praag & others, 2000). Interestingly, while enriched environments can increase neurogenesis,



Courtesy of Dr. Elizabeth Gould/ Princeton University

An Enriched Environment Primates in the wild live in complex, ever-changing environments. At psychologist Elizabeth Gould's Princeton lab, marmosets are housed in large enclosures with natural vegetation and novel objects that are changed frequently. In one experiment, synaptic and dendritic connections increased dramatically in marmosets who lived in the enriched environment for just four weeks after being raised in standard laboratory cages (Kozorovitskiy & others, 2004).

social isolation and a stressful environment *decrease* neurogenesis (Ming & Song, 2005).

Collectively, these changes result in increased processing and communication capacity in the brain. Behaviorally, enrichment has been shown to enhance performance on tasks designed to measure learning and memory, such as performance in different types of mazes (van Praag & others, 2000).

Who Moved My Exercise Wheel?

Neuroscientists have identified an additional factor that improves brain function, even in aging mammals: exercise (Hillman & others, 2008). In one study, just a month of daily exercise helped reverse cognitive declines associated with aging in previously sedentary, elderly mice (van Praag & others, 2005). After having access to an exercise wheel for 30 days, mice that were the rodent equivalent of 70 years old learned to navigate a maze much faster than mice of the same age that did not exercise. They also had better memories of maze locations. Finally, the physically active elderly mice had a greatly increased rate of neurogenesis, and the new neurons functioned as well as new neurons generated in the brains of young mice. As study coauthor Henriette van Praag (2005) points out, "Our findings show that it is never too late in life to start to exercise, and that doing so will likely delay the onset of aging-associated memory loss."

From Animal Studies to Humans

Enrichment studies have been carried out with many other species, including monkeys, cats, birds, honeybees, and even fruit flies. In all cases, enriched environments are associated with striking changes in the brain, however primitive.

Can the conclusions drawn from studies on rats, monkeys, and other animals be applied to human brains? Obviously, researchers cannot directly study the effects of enriched or impoverished environments on human brain tissue as they can with rats.

However, consider a study conducted by Ana Pereira and her colleagues (2007). Male and female participants, aged 21 to 45, were assessed for their overall level of fitness. Using MRI scans, each participant's brain was also mapped for amount of blood flowing into the hippocampus. Over the next three months, the participants worked out for one hour four times a week. Finally, the same physical and brain measurements were taken again.

As you probably anticipated, all of the participants had significantly improved their overall level of aerobic fitness. More importantly, they had also substantially increased the blood flow to their hippocampuses, in some cases doubling the blood flow as measured prior to the exercise program. In general, the greater the increase in a participant's aerobic fitness, the greater the increase in blood flow to the hippocampus.

Now for the key finding of the study: Along with the human subjects, a group of mice followed a comparable exercise program. In the mice, the exercise program resulted in increased blood flow in the *same* hippocampus regions as the humans. However, the researchers were able to directly examine brain changes in the mice. They found that the increased blood flow to the hippocampus in the mice was *directly* correlated to the birth of new neurons in the same region of the hippocampus. Although neuroscientists tend to be cautious in drawing conclusions, the implication of Pereira's study is obvious: Exercise promotes neurogenesis in the adult human brain just as it does in other mammals. A footnote: The participants in Pereira's study *also* improved their scores on several tests of mental abilities. Later studies have extended and confirmed these findings (Kobilo & others, 2011; Kuzumaki & others, 2011). And, recent research has shown that even moderate exercise can increase brain volume in previously sedentary, older adults (Erickson & others, 2011). We describe this study in more depth in Chapter 9.

Neuroscientists have also amassed an impressive array of correlational evidence showing the human benefits from enriched, stimulating environments. For example, several studies have compared symptoms of Alzheimer's disease in elderly individuals with different levels of education (Bennett & others, 2003). Autopsies showed that the more educated individuals had just as much damage to their brain cells as did the poorly educated individuals. However, because the better-educated people had more synaptic connections, their symptoms were much less severe than those experienced by the less educated people (Melton, 2005).

The results of this study echo earlier research on intellectual enrichment: A mentally stimulating, intellectually challenging environment is associated with enhanced cognitive functioning. Just as physical activity strengthens the heart and muscles, mental activity strengthens the brain. Even in late adulthood, remaining mentally and physically active can help prevent or lessen mental decline (Hertzog, 2009; Hillman & others, 2008; Kramer & Erickson, 2007).

Pumping Neurons: Exercising Your Brain

So, here's the critical question: Are you a mental athlete—or a cerebral couch potato? Whatever your age, there seems to be a simple prescription for keeping your brain fit. Along with regular physical activity, engaging in any kind of intellectually challenging pursuits will keep



AP Photo/Santa Monica Outlook, Bryan Mcclellan

Keeping the Brain Young Musical training involves many different cognitive, sensory, and motor processes. Thus, it's not surprising that playing a musical instrument is associated with improved cognitive abilities as well as changes in brain structure and function (Schlaug & others, 2005; Zatorre, 2005; Peretz & Zatorre, 2005). Could musical training and experience over the lifespan also be associated with better cognitive functioning in old age? Brenda Hanna-Pladdy and Alicia MacKay (2011) found that it was. In healthy adults aged 60 to 83, years of active musical participation was directly correlated with better cognitive functioning. Staying mentally and physically active and socially engaged can help keep the brain healthy and alert—at any age.

those dendrites developing. Enrichment need not involve exotic or expensive pursuits. Novelty and complexity can be as close as your college campus or library. Here are just a few suggestions:

- Get regular aerobic exercise, even if it's no more than a brisk daily walk. If possible, vary your routes and try to notice something new about your surroundings on each walk.
- Don't hide in your room or apartment—seek out social interaction (except when it interferes with studying). Remember, the brain thrives on social stimulation.
- Learn to play a musical instrument. If you can't afford music lessons, join a singing group or choir. If you already play a musical instrument, experiment with a new style or musical genre.
- Take a class in a field outside your college major or in a new area. Experiment by learning something in a field completely new to you.
- Read, and read widely. Buy magazines or check out library books in fields that are new to you.
- Try puzzles of all kinds—word, number, maze, or matching.
- Unplug your television set for two weeks—or longer.

Better yet, take a few minutes and generate your own list of mind-expanding opportunities!



CHAPTER REVIEW

Neuroscience and Behavior

KEY POINTS

Introduction: Neuroscience and Behavior

- Psychological and biological processes are closely linked. **Biological psychologists** investigate the physical processes that underlie psychological experience and behavior. **Neuroscience** is the study of the nervous system, especially the brain.

The Neuron: The Basic Unit of Communication

- Information in the nervous system is transmitted via cells specialized for communication, called **neurons.** There are three basic types of neurons: **sensory neurons, motor neurons,** and **interneurons.**
- Most neurons have three basic components: a **cell body, dendrites,** and an **axon.**
- **Glial cells** help neurons by providing structural support, removing waste products, and producing the **myelin sheath,** which helps insulate one axon from other axons. Glia are also involved in brain development and the communication of information between neurons.
- Within the neuron, information is communicated in the form of brief electrical messages called **action potentials.** The minimum level of stimulation required to activate a neuron is called the **stimulus threshold.** A neuron's **resting potential** is the state in which it is ready to activate and communicate its message if sufficiently stimulated. According to the **all-or-none law,** either a neuron is sufficiently stimulated and an action potential results, or it isn't sufficiently stimulated and an action potential doesn't occur.
- The point of communication between two neurons is called the **synapse.** Neurons communicate information to other neurons either electrically or chemically. In chemical communication, **neurotransmitters** cross the **synaptic gap** and affect neighboring neurons. These neurotransmitters are held within **synaptic vesicles,** which float in **axon terminals.** The entire process of transmitting information at the synapse is called **synaptic transmission. Reuptake** is the process in which neurotransmitter molecules detach from the receptor and are reabsorbed and recycled.
- There are many different kinds of neurotransmitters, which send either excitatory or inhibitory messages to the receiving neuron. Some drugs influence behavior and mental processes by influencing neurotransmitter activity. Important neurotransmitters include **acetylcholine, dopamine, serotonin, norepinephrine, GABA,** and **endorphins.**
- Drugs can mimic specific neurotransmitters. An **agonist** is a drug or other chemical that binds to a receptor. A drug can also act as an **antagonist** by blocking the effect of neurotransmitters.

The Nervous System and the Endocrine System: Communication Throughout the Body

- The **nervous system** is divided into two main divisions: the **central nervous system (CNS)** and the **peripheral nervous system.** The central nervous system is composed of the brain and the spinal cord. The spinal cord can produce **spinal reflexes.**
- The peripheral nervous system consists of all the **nerves** outside the central nervous system. The two main subdivisions of the peripheral nervous system are the **somatic nervous system** and the **autonomic nervous system.** The autonomic nervous system is divided into the **sympathetic nervous system** and the **parasympathetic nervous system.**
- The **endocrine system** is composed of glands that secrete **hormones** into the bloodstream, regulating many body functions, including physical growth, stress response, and sexual development. The endocrine system itself is regulated by the hypothalamus in the brain. Under the direction of the hypothalamus, the **pituitary gland** directly controls hormone production in other endocrine glands as well as hormones that act on physical processes. Another set of glands, called the **adrenal glands,** which

include the **adrenal cortex** and the **adrenal medulla,** produce hormones that are involved in the human stress response. The **gonads** are endocrine glands that secrete hormones that regulate sexual characteristics and reproductive processes.

A Guided Tour of the Brain

- Most psychological processes involve the integrated processing of information via neural pathways in multiple brain structures and regions.
- The human brain can change in response to environmental stimulation, training, or experience, displaying both **functional plasticity** and **structural plasticity.**
- Evidence suggests that **neurogenesis,** the development of new neurons, can occur in the adult brain.
- The major regions of the brain are the hindbrain, the midbrain, and the forebrain. Combined, the hindbrain and midbrain structures constitute the **brainstem.** Sensory and motor pathways cross over in the **hindbrain.** The key structures of the hindbrain are the **medulla,** the **cerebellum,** and the **pons.** The **reticular formation** is located in the core of the medulla and the pons.
- Auditory and visual information is integrated and coordinated in the **midbrain.** The **substantia nigra** is involved in motor control and contains a concentration of neurons that produce dopamine.
- The outer portion of the **forebrain** is called the **cerebral cortex.** The cerebral cortex is divided into the left and right **cerebral hemispheres,** with the **corpus callosum** serving as the main communication link between them. Each hemisphere is divided into four lobes. The **temporal lobe** contains the primary auditory cortex. The **occipital lobe** contains the primary visual cortex. The **parietal lobe** contains the somatosensory cortex. The **frontal lobe** contains the primary motor cortex. The remainder of the cerebral cortex is composed of association areas.
- The **limbic system** structures are found beneath the cerebral cortex and form neural circuits that play critical roles in learning, memory, and emotional control. The limbic system includes part of the frontal cortex and the **hippocampus, thalamus, hypothalamus,** and **amygdala.**

Specialization in the Cerebral Hemispheres

- The notion that particular areas of the brain are associated with particular functions is called **cortical localization.** In the mid-1800s, it was discovered that damage to the left hemisphere produced disruptions in speech and language called **aphasia.** Different forms of aphasia include Broca's aphasia and Wernicke's aphasia. Damage to the same areas of the right hemisphere did not produce aphasia. The notion that specific psychological or cognitive functions are processed primarily on one side of the brain is called **lateralization of function.**
- More evidence for the specialized abilities of the two hemispheres has resulted from the **split-brain operation,** in which the corpus callosum connecting the two hemispheres is cut. Roger Sperry and his colleagues demonstrated the different strengths of each hemisphere in split-brain patients. The left hemisphere is specialized for language tasks, and the right hemisphere is specialized for visual-spatial tasks.

KEY TERMS

biological psychology, p. 44
neuroscience, p. 44
neuron, p. 45
sensory neuron, p. 45
motor neuron, p. 45
interneuron, p. 45
cell body, p. 45
dendrites, p. 45
axon, p. 45
glial cells, or glia, p. 46
myelin sheath, p. 47
action potential, p. 47
stimulus threshold, p. 47
resting potential, p. 47
all-or-none law, p. 48
synapse, p. 49
synaptic gap, p. 49
axon terminals, p. 50
synaptic vesicles, p. 50
neurotransmitters, p. 50
synaptic transmission, p. 50
reuptake, p. 50
acetylcholine, p. 52
dopamine, p. 52
serotonin, p. 52
norepinephrine, p. 52
GABA (gamma-aminobutyric acid), p. 53
endorphins, p. 53
agonist, p. 54
antagonist, p. 55
nervous system, p. 56
nerves, p. 56
central nervous system (CNS), p. 56
spinal reflexes, p. 57
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somatic nervous system, p. 58
autonomic nervous system, p. 58
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KEY PEOPLE

Pierre Paul Broca (1824-1880) French surgeon and neuroanatomist who in 1861 discovered an area on the lower left frontal lobe of the cerebral cortex that, when damaged, produces speech disturbances but no loss of comprehension. (p. 75)

Roger Sperry (1913-1994) U.S. psychologist who received the Nobel prize in 1981 for his pioneering research on brain specialization in split-brain patients. (p. 77)

Karl Wernicke (1848-1905) German neurologist who in 1874 discovered an area on the left temporal lobe of the cerebral cortex that, when damaged, produces meaningless or nonsensical speech and difficulties in verbal or written comprehension. (p. 75)

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1. b 2. f 3. a 4. c 5. e 6. d

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1. c 2. b 3. d 4. d 5. a

2.3 page 80

1. hindbrain; midbrain; forebrain
2. cerebellum
3. temporal
4. primary motor cortex; frontal
5. hippocampus
6. limbic system
7. Broca's area
8. corpus callosum
9. suprachiasmatic nucleus



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CHAPTER 3

Sensation and Perception





Learning to See

PROLOGUE

MIKE WAS JUST THREE YEARS OLD when a jar of chemicals left in an old storage shed exploded in his face. The blast destroyed his left eye, and severely damaged his right eye. For more than four decades, Mike May was completely blind (Kurson, 2007).

But despite his blindness, Mike experienced—and accomplished—much more than most people ever dream of achieving. Always athletic, Mike played flag football in elementary school and wrestled and played soccer in high school and college. As an adult, he earned a master's degree in international affairs from Johns Hopkins University, went to work for the CIA, and then became a successful businessman.

He also learned to skydive, windsurf, water-ski, and snow-ski. How does a blind person ski down mountains? If you answered, "Very carefully," you'd be wrong—at least in Mike's case. With a guide skiing in front of him shouting "left" or "right" to identify obstacles, Mike hurtled down the most difficult black diamond slopes at speeds up to 65 miles per hour. In fact, Mike has won several medals in national and international championships for blind downhill speed skiing.

It was through skiing that Mike met his wife, Jennifer. An accomplished skier herself, she volunteered to be his guide at a ski slope. Today, Mike and Jennifer and their two sons are all avid skiers (Abrams, 2002).

In the 1990s, Mike started a successful company that develops global positioning devices, along with other mobility devices, for the blind. The portable navigation system gives visually impaired people information about their location, landmarks, streets, and so forth wherever they travel. With his white cane and guide dog, Josh, Mike traveled the world, both as a businessman and a tourist, ever optimistic and open to adventure (Kurson, 2007). His personal motto: "There is always a way."

But in 1999, Mike's keen sensory world of touch, sounds, and aroma was on the verge of expanding. A new surgical technique became available that offered the chance that Mike's vision might be restored in his right eye. On March 7, 2000, Jennifer held her breath as the bandages were removed. "It was so unexpected—there was just a whoosh! of light blasting into my eye," Mike later recalled (May, 2002b). For the first time since he was three years old, Mike May could see.

And what was it like when Mike could see Jennifer for the first time? "It was incredible," he explained, "but the truth is, I knew exactly what she looked like, so it wasn't all that dramatic to see her. The same with my kids. Now, seeing other people that I can't touch, well, that's interesting because I couldn't see them before."

IN THIS CHAPTER:

- Introduction: What Are Sensation and Perception?
- Vision: From Light to Sight
- Hearing: From Vibration to Sound
- The Chemical and Body Senses: Smell, Taste, Touch, and Position
- Perception
- Perceptual Illusions
- The Effects of Experience on Perceptual Interpretations
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Strategies to Control Pain



Florence Low

A Little Bit of Vision... Although Mike could "see" from the moment the bandages were removed from his eye *(below)*, he still had trouble identifying objects, especially stationary ones. Mike tells this story of a walk down an unfamiliar street in Barcelona, Spain: "I picked my way through some street construction. I saw a fluorescent green object in my path and tapped it with my cane. It wasn't hard like a sign so I tapped it a bit harder as I still couldn't figure out visually what it was. I was startled as a burst of Spanish profanity came from the workman bent over digging out a hole in the sidewalk. He didn't take too kindly to me poking him in the behind with my cane. A little bit of vision can be dangerous sometimes" (May, 2004).



Florence Low

But what did Mike see? Anatomically, his right eye was now normal. But rather than being 20/20, his vision was closer to 20/1,000. What that means is his view of the world was very blurry. He could see colors, shapes, lines, shadows, light and dark patches. So why wasn't the world crystal clear?

Although the structures of his eye were working, his brain did not know how to interpret the signals it was receiving. As neuropsychologist Ione Fine (2002) explained, "Most people learn the language of vision between the age of birth and two years old. Mike has had to learn it as an adult." Indeed, there is much more to *seeing* than meets the eye.

Faces posed a particular challenge for Mike. During conversations, he found it very distracting to look at people's faces. As Mike wrote in his journal, "I can see their lips moving, eyelashes flickering, head nodding, and hands gesturing. It was easiest to close my eyes or tune out the visual input. This was often necessary in order to pay attention to what they were saying" (May, 2004).

And what was it like the first time he went skiing, just weeks after his surgery? Mike was dazzled by the sight of the tall, dark green trees, the snow, and the distant peaks against the blue sky (May, 2004). But although you might think that vision, even blurry vision, would be a distinct advantage to an expert skier, this was not the case. Mike found it easier to ski with his eyes closed, with Jennifer skiing ahead and shouting out directions. With his eyes open, he was overwhelmed by all the visual stimuli and the frightening sense that objects were rushing toward him. "By the time I thought about and guessed at what the shadows on the snow meant, I would miss the turn or fall on my face. It was best to close my eyes," he explained.

Throughout this chapter, we will come back to Mike's story. We'll also tell you what neuropsychologists Ione Fine and Don MacLeod learned after conducting fMRI scans of Mike's brain. And, later in the chapter, we'll see how well you do, compared to Mike, at deciphering some visual illusions.



Introduction: What Are Sensation and Perception?

Glance around you. Notice the incredible variety of colors, shades, shadows, and images. Listen carefully to the diversity of sounds, loud and soft, near and far. Focus on everything that's touching you—your clothes, your shoes, the chair you're sitting on. Now, inhale deeply through your nose and identify the aromas in the air.

With these simple observations you have exercised four of your senses: vision, hearing, touch, and smell. As we saw in Chapter 2, the primary function of the nervous system is communication—the transmission of information from one part of the body to the other. Where does that information come from? Put simply, your senses are the gateway through which your brain receives all its information about the environment. It's a process that is so natural and automatic that we typically take it for granted until it is disrupted by illness or injury. Nevertheless, as Mike's story demonstrates, people with one nonfunctional sense are amazingly adaptive. Often, they learn to compensate for the missing environmental information by relying on their other senses.

In this chapter, we will explore the overlapping processes of *sensation* and *perception*. **Sensation** refers to the detection and basic sensory experience of environmental stimuli, such as sounds, images, and odors. **Perception** occurs when we integrate, organize, and interpret sensory information in a way that is meaningful. Here's a simple example

sensation The process of detecting a physical stimulus, such as light, sound, heat, or pressure.

perception The process of integrating, organizing, and interpreting sensations.

to contrast the two terms. Your eyes' physical response to light, splotches of color, and lines reflects *sensation*. Integrating and organizing those sensations so that you interpret the light, splotches of color, and lines as a painting, a flag, or some other object reflects *perception*. Mike's visual world reflects this distinction. Although his eye was accurately transmitting visual information from his environment (*sensation*), his brain was unable to make sense out of the information (*perception*).

Where does the process of sensation leave off and the process of perception begin? There is no clear boundary line between the two processes as we actually experience them. In fact, many researchers in this area of psychology regard sensation and perception as a single process.

Although the two processes overlap, we will present sensation and perception as separate discussions. In the first half of the chapter, we'll discuss the basics of *sensation*—how our sensory receptors respond to stimulation and transmit that information in usable form to the brain. In the second half of the chapter, we'll explore *perception*—how the brain actively organizes and interprets the signals sent from our *sensory receptors*.



Mark Scoggins/Getty Images

Experiencing the World Through Our Senses Imagine biting into a fresh, juicy slice of watermelon. All your senses are involved in your experience—vision, smell, taste, hearing, and touch. Although we're accustomed to thinking of our different senses as being quite distinct, all forms of sensation involve the stimulation of specialized cells called sensory receptors.

Basic Principles of Sensation

KEY THEME

› Sensation is the result of neural impulses transmitted to the brain from sensory receptors that have been stimulated by physical energy from the external environment.

KEY QUESTIONS

› What is the process of transduction?

› What is a sensory threshold, and what are two main types of sensory thresholds?

› How do sensory adaptation and Weber's law demonstrate that sensation is relative rather than absolute?

We're accustomed to thinking of the senses as being quite different from one another. However, all our senses involve some common processes. All sensation is a result of the stimulation of specialized cells, called **sensory receptors,** by some form of *energy*.

Imagine biting into a juicy slice of watermelon. Your experience of hearing the watermelon crunch is a response to the physical energy of vibrations in the air, or *sound waves*. The sweet taste of the watermelon is a response to the physical energy of *dissolvable chemicals* in your mouth, just as the distinctive sharp aroma of the watermelon is a response to *airborne chemical molecules* that you inhale through your nose. The smooth feel of the watermelon's skin is a response to the *pressure* of the watermelon against your hand. And the bright red color of the watermelon is a response to the physical energy of *light waves* reflecting from the irregularly shaped object into which you've just bitten.

Sensory receptors convert these different forms of physical energy into electrical impulses that are transmitted via neurons to the brain. The process by which a form of physical energy is converted into a coded neural signal that can be processed by the nervous system is called **transduction.** These neural signals are sent to the brain, where the perceptual processes of organizing and interpreting the coded messages occur. Figure 3.1 on the next page illustrates the basic steps involved in sensation and perception.

We are constantly being bombarded by many different forms of energy. For instance, at this very moment radio and television waves are bouncing around the atmosphere and passing through your body. However, sensory receptors are so highly specialized that they are sensitive only to very specific types of energy (which is lucky, or you might be seeing *Seinfeld* reruns in your brain right now). So, for any type of stimulation to be sensed, the stimulus energy must first be in a form that can be detected by our sensory receptor cells. Otherwise, transduction cannot occur.

sensory receptors Specialized cells unique to each sense organ that respond to a particular form of sensory stimulation.

transduction The process by which a form of physical energy is converted into a coded neural signal that can be processed by the nervous system.

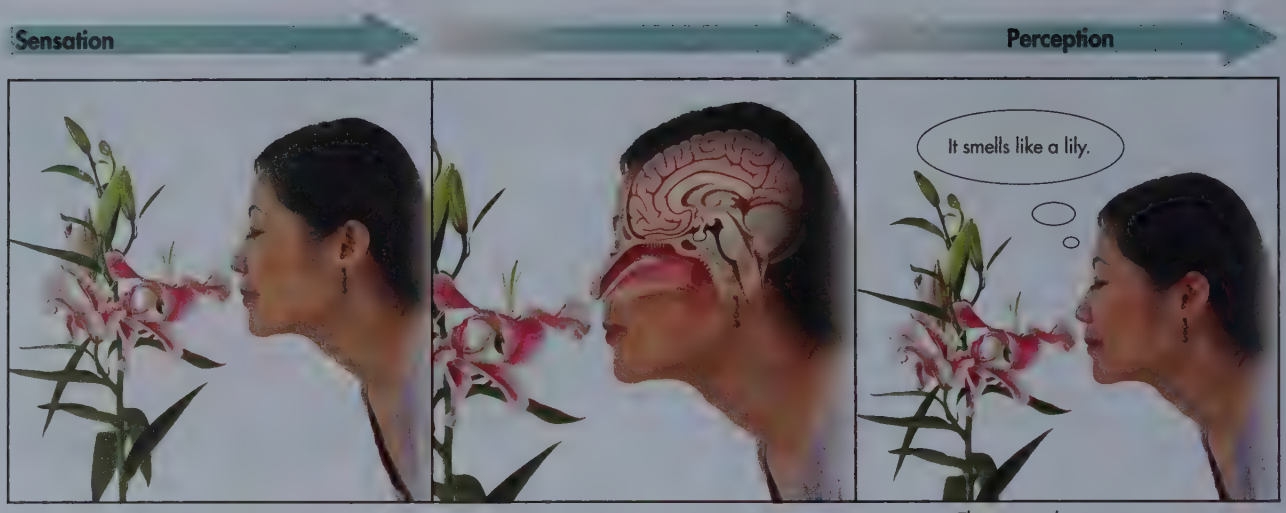


FIGURE 3.1 The Basic Steps of Sensation and Perception

- **absolute threshold** The smallest possible strength of a stimulus that can be detected half the time.
- **difference threshold** The smallest possible difference between two stimuli that can be detected half the time; also called *just noticeable difference.*
- **Weber's law** (VAY-berz) A principle of sensation that holds that the size of the just noticeable difference will vary depending on its relation to the strength of the original stimulus.
- **subliminal perception** The detection of stimuli that are below the threshold of conscious awareness; nonconscious perception.
- **mere exposure effect** The finding that repeated exposure to a stimulus increases a person's preference for that stimulus.

TABLE 3.1

Absolute Thresholds

Sense	Absolute Threshold
Vision	A candle flame seen from 30 miles away on a clear, dark night
Hearing	The tick of a watch at 20 feet
Taste	One teaspoon of sugar in two gallons of water
Smell	One drop of perfume throughout a three-room apartment
Touch	A bee's wing falling on your cheek from a height of about half an inch

Psychologist Eugene Galanter (1962) provided these classic examples of the absolute thresholds for our senses. In each case, people are able to sense these faint stimuli at least half the time.

Sensory Thresholds

Along with being specialized as to the types of energy that can be detected, our senses are specialized in other ways as well. We do not have an infinite capacity to detect all levels of energy. To be sensed, a stimulus must first be strong enough to be detected—loud enough to be heard, concentrated enough to be smelled, bright enough to be seen. The point at which a stimulus is strong enough to be detected because it activates a sensory receptor cell is called a *threshold.* There are two general kinds of sensory thresholds for each sense—the absolute threshold and the difference threshold.

The **absolute threshold** refers to the smallest possible strength of a stimulus that can be detected half the time. Why just half the time? It turns out that the minimum level of stimulation that can be detected varies from person to person and from trial to trial. Because of this human variability, researchers have arbitrarily set the limit as the minimum level of stimulation that can be detected half the time. Under ideal conditions (which rarely occur in normal daily life), our sensory abilities are far more sensitive than you might think (see Table 3.1). Can stimuli that are below the absolute threshold affect us? We discuss this question in the Science Versus Pseudoscience box, "Subliminal Perception."

The other important threshold involves detecting the *difference* between two stimuli. The **difference threshold** is the smallest possible difference between two stimuli that can be detected half the time. Another term for the difference threshold is *just noticeable difference,* which is abbreviated *jnd.*

The just noticeable difference will *vary* depending on its relation to the original stimulus. This principle of sensation is called *Weber's law,* after the German physiologist Ernst Weber (1795–1878). **Weber's law** holds that for each sense, the size of a just noticeable difference is a constant proportion of the size of the initial stimulus. So, whether we can detect a change in the strength of a stimulus depends on the intensity of the *original* stimulus. For example, if you are holding a pebble (the original stimulus), you will notice an increase in weight if a second pebble is placed in your hand. But if you start off holding a very heavy rock (the original stimulus), you probably won't detect an increase in weight when the same pebble is balanced on it.

What Weber's law underscores is that our psychological experience of sensation is *relative.* That is, there is no simple, one-to-one correspondence between the objective characteristics of a physical stimulus, such as the weight of a pebble, and our psychological experience of it.

SCIENCE VERSUS PSEUDOSCIENCE

Subliminal Perception

What are subliminal messages? Can they influence people to quit smoking, lose weight, or change their personalities? **Subliminal perception** refers to the detection of stimuli that are below the threshold of conscious perception or awareness. Such stimuli might be rapidly flashed visual images, sounds, or odors that are too faint to be consciously detected. Although not consciously perceived, subliminal stimuli can evoke a brain response (Bahrami & others, 2007; Tamietto & de Gelder, 2010).

The notion that people's behavior could be manipulated by subliminal messages first attracted public attention in 1957. James Vicary, a marketing executive, claimed to have increased concession sales at a New Jersey movie theater by subliminally flashing the words "Eat popcorn" and "Drink Coke" during the movie.

Controlled tests, however, failed to replicate Vicary's claims, and Vicary later admitted that his boast was a hoax to drum up customers for his failing marketing business (Dijksterhuis & others, 2005; Fullerton, 2010). Nevertheless, to this day, many people still believe—and some advertisements claim—that subliminal messages can exert an irresistible, lasting influence.

Can your behavior be profoundly influenced by subliminal self-help CDs, audio tapes, or computer programs? Or by vague images or words embedded in advertisements? No. Numerous studies have shown that subliminal self-help products do *not* produce the changes they claim to produce (Strahan & others, 2005). Likewise, numerous studies on subliminal messages in advertising have shown that they do not influence actual consumer decisions (Simons & others, 2007).

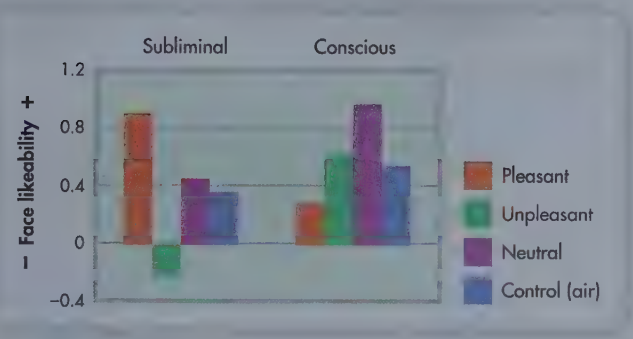
But do subliminal stimuli have *any* effect? Surprisingly, the answer is a qualified *yes*. For example, consider the **mere exposure effect**, which refers to the well-documented finding that repeated exposure to a particular stimulus leads to increased liking for that stimulus (Zajonc, 2001; Moreland & Topolinski, 2010). The mere exposure effect also holds for subliminally presented stimuli. For example, when people are exposed to subliminal images of a particular geometric shape and, minutes later, are asked to pick the shape they prefer from a group of shapes, they are much more likely to choose the subliminally presented shape.

Subliminal stimuli *can* influence actual behavior—but only under certain conditions. Research suggests that subliminal stimuli are effective *only* when they are relevant to goals that are already held by the observer. So, for example, subliminally flashing the words "Lipton One" made research participants slightly more likely to say that they preferred Lipton One over another brand—but *only* if they were already thirsty. The subliminal stimulus had *no* effect on participants who weren't thirsty (Karremans & others, 2006).

Beyond preferences, attitudes and emotions can also be influenced by subliminal stimuli (Smith & others, 2008; Westen & others, 2007). For example, participants were subliminally exposed to faces expressing fear, disgust, or a neutral emotion before being asked to rate the pleasantness of other faces presented on a computer screen. Faces that were preceded by subliminal "fear" stimuli were rated as most unpleasant (Lee & others, 2011).

Can other sensory cues affect us without our awareness? One intriguing study investigated the effect of subliminal odors (Li & others, 2007). Participants rated pictures of faces for "likeability" after sniffing either a pleasant, lemony scent; an unpleasant scent (think high school locker room); a neutral scent; or no scent at all (air). The catch was that 75% of the time, the odors were so faint that they could not be consciously detected. Did the subliminal odors affect the likeability ratings?

Yes—but *only* when participants were unaware of which scent they were sniffing. Faces paired with the subliminal pleasant odor received the highest ratings, while faces paired with the subliminal unpleasant odor received the lowest ratings (see graph). However, when participants were aware of an odor, the correlation between likeability and odor pleasantness disappeared.



Effects of Subliminal Odors After smelling pleasant, unpleasant, or neutral odors, participants rated photographs of faces on a scale ranging from "extremely unlikeable" to "extremely likeable." Participants' judgments were affected by subliminal odors—but not odors that they could consciously perceive.

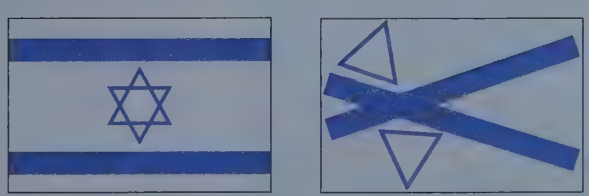
Why? According to lead researcher Wen Li (2007), "People who were conscious of the barely noticeable scents were able to discount that sensory information and just evaluate the faces." But participants who were *not* conscious of the odors attributed their response to the "pleasantness" or "unpleasantness" of the face they were rating, rather than to the smell that they could *not* consciously perceive.

Studies on subliminal effects usually involve expressing preferences about contrived stimuli, such as geometric figures or photographs of strangers. But an Israeli study demonstrated that subliminal stimuli can also briefly influence real-world attitudes (Hassin & others, 2007). Participants with known political views were exposed to subliminal images of either the Israeli flag or, as a control, a scrambled flag image, before answering a series of questions about controversial political issues.

Did subliminal exposure to the Israeli flag have any effect on political attitudes? *Yes*. Participants who were exposed to the Israeli flag expressed more moderate responses to the political questions than would have been predicted from their previous political positions. But the control group participants, who saw only a scrambled image, did not change their views.

Why did subliminal exposure to the national flag shift attitudes toward a more middle-of-the-road stance? One hypothesis is that the subliminal images of flags and other national symbols evoke a sense of national unity, drawing people closer to the political center (Butz, 2009; Hassin & others, 2007).

The bottom line? Subliminal stimuli can briefly influence attitudes, thoughts, preferences, and emotions (Dijksterhuis & Nordgren, 2006). But the key word here is *briefly*. These transient influences are a far cry from the pseudoscientific claims of some subliminal self-help products that promise easy and sweeping changes in behavior, personality, or motivation.



Experimental Stimulus **Control Stimulus**

Subliminal stimuli used in Hassin & others, 2007 study.

sensory adaptation The decline in sensitivity to a constant stimulus.

wavelength The distance from one wave peak to another.

cornea (CORE-nee-uh) A clear membrane covering the visible part of the eye that helps gather and direct incoming light.

pupil The opening in the middle of the iris that changes size to let in different amounts of light.

iris (EYE-riss) The colored part of the eye, which is the muscle that controls the size of the pupil.

Sensory Adaptation

Suppose your best friend has invited you over for a spaghetti dinner. As you walk in the front door, you're almost overwhelmed by the odor of onions and garlic cooking on the stove. However, after just a few moments, you no longer notice the smell. Why? Because your sensory receptor cells become less responsive to a constant stimulus. This gradual decline in sensitivity to a constant stimulus is called **sensory adaptation.** Once again, we see that our experience of sensation is relative—in this case, relative to the *duration of exposure.*

Because of sensory adaptation, we become accustomed to constant stimuli, which allows us to quickly notice new or changing stimuli. This makes sense. If we were continually aware of all incoming stimuli, we'd be so overwhelmed with sensory information that we wouldn't be able to focus our attention. So, for example, once you manage to land your posterior on the sofa, you don't need to be constantly reminded that the sofa is beneath you.

Vision

From Light to Sight

KEY THEME

› The receptor cells for vision respond to the physical energy of light waves and are located in the retina of the eye.

KEY QUESTIONS

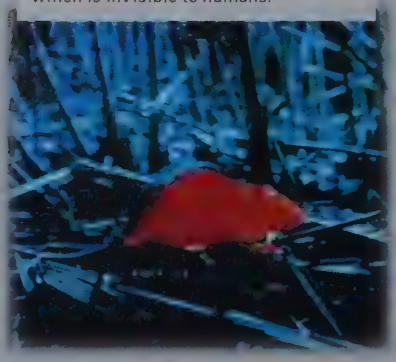
› What is the visible spectrum?

› What are the key structures of the eye and their functions?

› What are rods and cones, and how do their functions differ?

A lone caterpillar on the screen door, the pile of dirty laundry in the corner of the closet, a spectacular autumn sunset, the intricate play of color, light, and texture in a painting by Monet. The sense organ for vision is the eye, which contains receptor cells that are sensitive to the physical energy of *light.* Before we can talk about how the eye functions, we need to briefly discuss some characteristics of light as the visual stimulus.

How a Pit Viper Sees a Mouse at Night Does the world look different to other species? In many cases, yes. Each species has evolved a unique set of sensory capabilities. Pit vipers see infrared light, which we sense only as warmth. The mouse here has been photographed through an infrared viewer. The image shows how a pit viper uses its infrared "vision" to detect warm-blooded prey at night (Van Dyke & Grace, 2010). Similarly, many insect and bird species can detect ultraviolet light, which is invisible to humans.



John Downer/Planet Earth Pictures

What We See

The Nature of Light

Light is just one of many different kinds of electromagnetic energy that travel in the form of waves. Other forms of electromagnetic energy include X-rays, the microwaves you use to pop popcorn, and the infrared signals or radio waves transmitted by your TV's remote control. The various types of electromagnetic energy differ in **wavelength,** which is the distance from one wave peak to another.

Humans are capable of seeing only a minuscule portion of the electromagnetic energy range. In Figure 3.2, notice that the visible portion of the electromagnetic energy spectrum can be further divided into different wavelengths. As we'll discuss in more detail later, the different wavelengths of visible light correspond to our psychological perception of different colors.

How We See

The Human Visual System

Suppose you're watching your neighbor's yellow and white tabby cat sunning himself on the front steps. How do you see the cat? Simply seeing a yellow tabby cat involves a complex chain of events. We'll describe the process of vision from the object to the brain. You can trace the path of light waves through the eye in Figure 3.3.

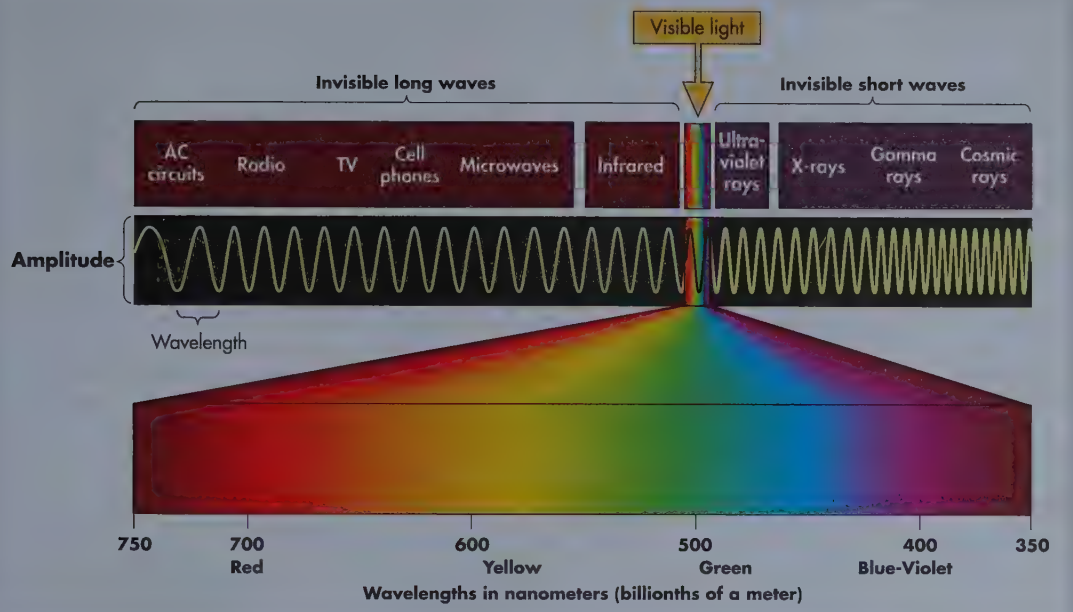


FIGURE 3.2 The Electromagnetic Spectrum We are surrounded by different kinds of electromagnetic energy waves, yet we are able to see only a tiny portion of the entire spectrum of electromagnetic energy. Some electronic instruments, like radio and television, are specialized receivers that detect a specific wavelength range. Similarly, the human eye is sensitive to a specific and very narrow range of wavelengths.

First, light waves reflected from the cat enter your eye, passing through the *cornea*, *pupil*, and *lens*. The **cornea,** a clear membrane that covers the front of the eye, helps gather and direct incoming light. The *sclera*, or white portion of the eye, is a tough, fibrous tissue that covers the eyeball except for the cornea. The **pupil** is the black opening in the eye's center. The pupil is surrounded by the **iris,** the colored structure that we refer to when we say that someone has brown eyes. The iris is actually a ring

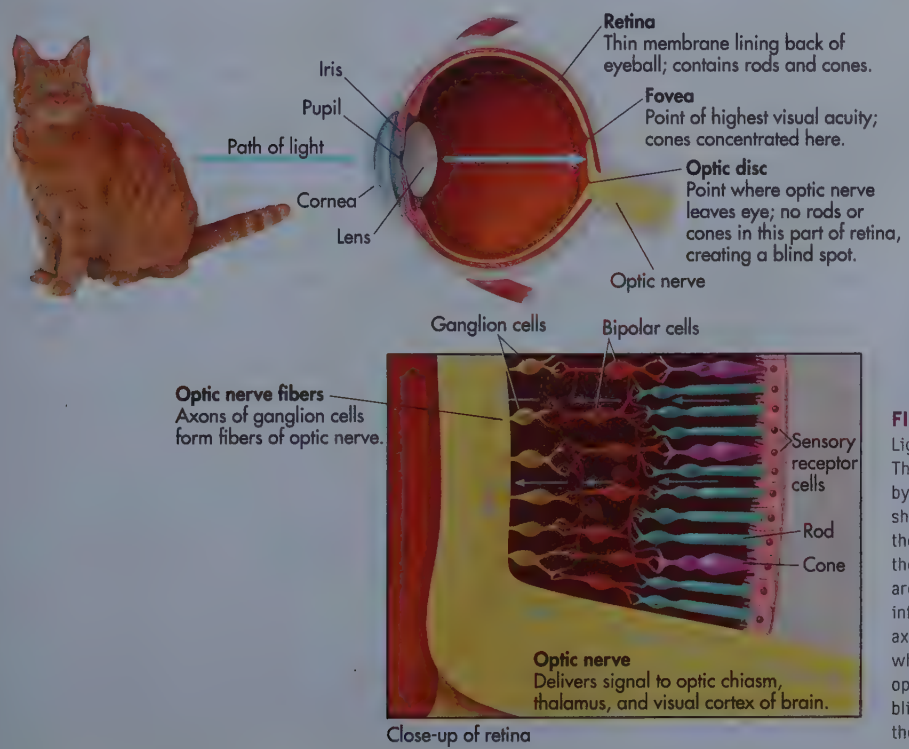


FIGURE 3.3 Path of Light in a Human Eye Light waves pass through the cornea, pupil, and lens. The iris controls the amount of light entering the eye by controlling the size of the pupil. The lens changes shape to focus the incoming light onto the retina. As the light strikes the retina, the light energy activates the rods and cones. Signals from the rods and cones are collected by the bipolar cells, which transmit the information to the ganglion cells. The ganglion cell axons are bundled together to form the optic nerve, which transmits the information to the brain. The optic nerve leaves the eye at the optic disk, creating a blind spot in our visual field. (For a demonstration of the blind spot, see Figure 3.4 on page 95.)

lens A transparent structure, located behind the pupil, that actively focuses, or bends, light as it enters the eye.

accommodation The process by which the lens changes shape to focus incoming light so that it falls on the retina.

retina (RET-in-uh) A thin, light-sensitive membrane, located at the back of the eye, that contains the sensory receptors for vision.

rods The long, thin, blunt sensory receptors of the eye that are highly sensitive to light, but not to color, and that are primarily responsible for peripheral vision and night vision.

cones The short, thick, pointed sensory receptors of the eye that detect color and are responsible for color vision and visual acuity.

fovea (FO-vee-uh) A small area in the center of the retina, composed entirely of cones, where visual information is most sharply focused.

optic disk Area of the retina without rods or cones, where the optic nerve exits the back of the eye.

of muscular tissue that contracts or expands to precisely control the size of the pupil and thus the amount of light entering the eye. In dim light, the iris widens the pupil to let light in; in bright light, the iris narrows the pupil.

Behind the pupil is the **lens,** another transparent structure. In a process called **accommodation,** the lens thins or thickens to bend or focus the incoming light so that the light falls on the retina. If the eyeball is abnormally shaped, the lens may not properly focus the incoming light on the retina, resulting in a visual disorder. In nearsightedness, or *myopia,* distant objects appear blurry because the light reflected off the objects focuses in front of the retina. In farsightedness, or *hyperopia,* objects near the eyes appear blurry because light reflected off the objects is focused behind the retina. During middle age, another form of farsightedness often occurs, called *presbyopia.* Presbyopia is caused when the lens becomes brittle and inflexible. In *astigmatism,* an abnormally curved eyeball results in blurry vision for lines in a particular direction. Corrective glasses remedy these conditions by intercepting and bending the light so that the image falls properly on the retina. New surgical techniques, such as LASIK, correct visual disorders by reshaping the cornea so that light rays focus more directly on the retina.

The Retina

Rods and Cones

The **retina** is a thin, light-sensitive membrane that lies at the back of the eye, covering most of its inner surface (see Figure 3.3). Contained in the retina are the **rods** and **cones.** Because these sensory receptor cells respond to light, they are often called *photoreceptors.* When exposed to light, the rods and cones undergo a chemical reaction that results in a neural signal.

Rods and cones differ in many ways. First, as their names imply, rods and cones are shaped differently. Rods are long and thin, with blunt ends. Cones are shorter and fatter, with one end that tapers to a point. The eye contains far more rods than cones. It is estimated that each eye contains about 7 million cones and about 125 million rods!

Rods and cones are also specialized for different visual functions. Although both are light receptors, rods are much more sensitive to light than are cones. Once the rods are fully adapted to the dark, they are about a thousand times better than cones at detecting weak visual stimuli (Masland, 2001). We therefore rely primarily on rods for our vision in dim light and at night.

Rods and cones also react differently to *changes* in the amount of light. Rods adapt relatively slowly, reaching maximum sensitivity to light in about 30 minutes. In contrast, cones adapt quickly to bright light, reaching maximum sensitivity in about 5 minutes. That's why it takes several minutes for your eyes to adapt to the dim light of a darkened room but only a few moments to adapt to the brightness when you switch on the lights.

You may have noticed that it is difficult or impossible to distinguish colors in very dim light. This difficulty occurs because only the cones are sensitive to the different wavelengths that produce the sensation of color, and cones require much more light than rods do to function effectively. Cones are also specialized for seeing fine details and for vision in bright light.

Most of the cones are concentrated in the **fovea,** which is a region in the very center of the retina. Cones are scattered throughout the rest of the retina, but they become progressively less common toward the periphery of the retina. There are no rods in the fovea. Images that do not fall on the fovea tend to be perceived as blurry or indistinct. For example, focus your eyes on the word "For" at the beginning of this sentence. In contrast to the sharpness of the letters in "For," the words to the left and right are somewhat blurry. The image of the outlying words is striking the peripheral areas of the retina, where rods are more prevalent and there are very few cones.

Slim Rods and Fat Cones The rods and cones in the retina are the sensory receptors for vision. They convert light into electrical impulses that are ultimately transmitted to the brain. Color has been added to this scanning electromicrograph to clearly distinguish the rods and cones. The rods, colored green, are long, thin, and more numerous than the cones, colored blue, which are tapered at one end and shorter and fatter than the rods. As the photo shows, the rods and cones are densely packed in the retina, with many rods surrounding a few cones.



Omikron/Science Photo Library

The Blind Spot

One part of the retina lacks rods and cones altogether. This area, called the **optic disk,** is the point at which the fibers that make up the optic nerve leave the back of the eye and project to the brain. Because there are no photoreceptors in the optic



FIGURE 3.4 Demonstration of the Blind Spot Hold this book a few feet in front of you. Close your right eye and stare at the insect spray can with your left eye. Slowly bring the book toward your face. At some point the spider will disappear because you have focused it onto the part of your retina where the blind spot is located. Notice, however, that you still perceive the spider web. That's because your brain has filled in information from the surrounding area (Komatsu, 2006).

disk, we have a tiny hole, or **blind spot,** in our field of vision. To experience the blind spot, try the demonstration in Figure 3.4.

Why don't we notice this hole in our visual field? The most compelling explanation is that the brain actually fills in the missing background information (Ramachandran, 1992; Weil & Rees, 2010). In effect, signals from neighboring neurons fill in the blind spot with the color and texture of the surrounding visual information (Supèr & Romeo, 2011).

Processing Visual Information

KEY THEME

› Signals from the rods and cones undergo preliminary processing in the retina before they are transmitted to the brain.

KEY QUESTIONS

› What are the bipolar and ganglion cells, and how do their functions differ?

› How is visual information transmitted from the retina to the brain?

› What properties of light correspond to color perceptions, and how is color vision explained?

Visual information is processed primarily in the brain. However, before visual information is sent to the brain, it undergoes some preliminary processing in the retina by specialized neurons called **ganglion cells.** This preliminary processing of visual data in the cells of the retina is possible because the retina develops from a bit of brain tissue that "migrates" to the eye during fetal development (Hubel, 1995).

When the numbers of rods and cones are combined, there are over 130 million receptor cells in each retina. However, there are only about 1 million ganglion cells. How do just 1 million ganglion cells transmit messages from 130 million visual receptor cells?

Visual Processing in the Retina

Information from the sensory receptors, the rods and cones, is first collected by specialized neurons, called **bipolar cells** (see the lower part of Figure 3.3). The bipolar cells then funnel the collection of raw data to the ganglion cells. Each ganglion cell receives information from the photoreceptors that are located in its *receptive field* in a particular area of the retina. In this early stage of visual processing, each ganglion cell combines, analyzes, and encodes the information from the photoreceptors in its receptive field before transmitting the information to the brain (Ringach, 2009).

blind spot The point at which the optic nerve leaves the eye, producing a small gap in the field of vision.

ganglion cells In the retina, the specialized neurons that connect to the bipolar cells; the bundled axons of the ganglion cells form the optic nerve.

bipolar cells In the retina, the specialized neurons that connect the rods and cones with the ganglion cells.

optic nerve The thick nerve that exits from the back of the eye and carries visual information to the visual cortex in the brain.

optic chiasm (KI-az-em) Point in the brain where the optic nerve fibers from each eye meet and partly cross over to the opposite side of the brain.

Signals from rods and signals from cones are processed differently in the ganglion. For the most part, a single ganglion cell receives information from only one or two cones but might well receive information from a hundred or more rods. The messages from these many different rods are combined in the retina before they are sent to the brain. Thus, the brain receives less specific visual information from the rods and messages of much greater visual detail from the cones.

As an analogy to how rod information is processed, imagine listening to a hundred people trying to talk at once over the same telephone line. You would hear the sound of many people talking, but individual voices would be blurred. Now imagine listening to the voice of a single individual being transmitted across the same telephone line. Every syllable and sound would be clear and distinct. In much the same way, cones use the ganglion cells to provide the brain with more specific visual information than is received from rods.

Because of this difference in how information is processed, cones are especially important in *visual acuity*—the ability to see fine details. Visual acuity is strongest when images are focused on the fovea because of the high concentration of cones there.

From Eye to Brain

How is information transmitted from the ganglion cells of the retina to the brain? The 1 million axons of the ganglion cells are bundled together to form the **optic nerve,** a thick nerve that exits from the back of the eye at the optic disk and extends to the brain (see Figure 3.5). The optic nerve has about the same diameter as a pencil. After exiting the eyes, the left and right optic nerves meet at the **optic chiasm.** Then the fibers of the left and right optic nerves split in two. One set of axons crosses over and projects to the opposite side of the brain. The other set of axons forms a pathway that continues along the same side of the brain (see Figure 3.5).

From the optic chiasm, most of the optic nerve axons project to the brain structure called the *thalamus.* This primary pathway seems to be responsible for processing information about form, color, brightness, and depth. A smaller number of axons follow a detour to areas in the *midbrain* before they make their way to the thalamus. This secondary pathway seems to be involved in processing information about the location of an object.

Neuroscientists now know that there are several distinct neural pathways in the visual system, each responsible for handling a different aspect of vision (Paik &

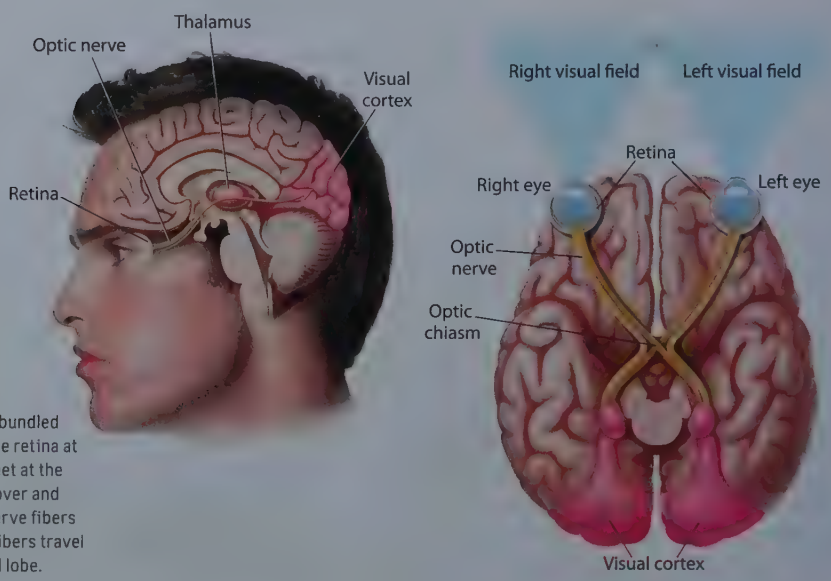


FIGURE 3.5 Neural Pathways from Eye to Brain The bundled axons of the ganglion cells form the optic nerve, which exits the retina at the optic disk. The optic nerves from the left and right eyes meet at the optic chiasm, then split apart. One set of nerve fibers crosses over and projects to the opposite side of the brain, and another set of nerve fibers continues along the same side of the brain. Most of the nerve fibers travel to the thalamus and then on to the visual cortex of the occipital lobe.

Ringach, 2011; Purves, 2009). Although specialized, the separate pathways are highly interconnected. From the thalamus, the signals are sent to the visual cortex, where they are decoded and interpreted.

Most of the receiving neurons in the visual cortex of the brain are highly specialized. Each responds to a particular type of visual stimulation, such as angles, edges, lines, and other forms, and even to the movement and distance of objects (Hubel & Wiesel, 2005; Livingstone & Hubel, 1988). These neurons are sometimes called *feature detectors* because they detect, or respond to, particular features or aspects of more complex visual stimuli. Reassembling the features into a recognizable image involves additional levels of processing in the visual cortex and other regions of the brain, including the *frontal lobes*.

Understanding exactly how neural responses of individual feature detection cells become integrated into the visual perceptions of faces and objects is a major goal of contemporary neuroscience (Celesia, 2010; Manoach & Catmanatz, 2011). As the Focus on Neuroscience illustrates, experience plays a key role in perception.

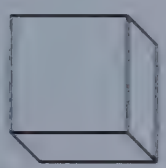
FOCUS ON NEUROSCIENCE

Vision, Experience, and the Brain

After Mike's surgery, his retina and optic nerve were completely normal. Formal testing showed that Mike had excellent color perception and that he could easily identify simple shapes and lines that were oriented in different directions. These abilities correspond to visual pathways that develop very early. Mike's motion perception was also very good. When thrown a ball, he could catch it more than 80 percent of the time.

Perceiving and identifying common objects, however, was difficult. Although Mike could "see" an object, he had to consciously use visual cues to work out its identity. For example, when shown the simple drawing above right, called a "Necker cube," Mike described it as "a square with lines." But when shown the same image as a rotating image on a computer screen, Mike immediately identified it as a cube. Functional MRI scans showed that Mike's brain activity was nearly normal when shown a moving object.

What about more complex objects, like faces? Even three years after his surgery, Mike recognizes his wife and sons by their hair color, gait, and other clues, *not* by their faces. He can't tell whether a face is male or female, or whether its expression is happy or sad. Functional MRI scans revealed that when Mike is shown faces or objects, the part of the brain that is normally activated is silent (see brain scans).



Necker Cube

Necker Cube Shown a stationary image of a Necker cube, Mike described it as "a square with lines." Only when the image began to rotate did Mike perceive it as a drawing of a cube.

For people with normal vision, recognizing complex three-dimensional objects—like tables, shoes, trees, or pencils—is automatic. But as Mike's story shows, these perceptual conclusions are actually based on experience and built up over time.

Neuroscientist Ione Fine and her colleagues (2008, 2009), who have studied Mike's visual abilities, believe that Mike's case indicates that some visual pathways develop earlier than others. Color and motion perception, they point out, develop early in infancy. But because people will continue to encounter new objects and faces throughout life, areas of the brain that are specialized to process faces and objects show plasticity. In Mike's case, these brain centers never developed.

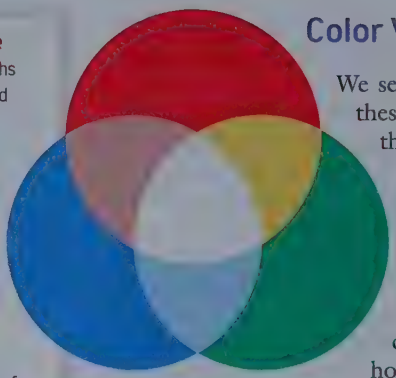


Normal Control

Mike Wa

Scanning Mike's Brain The red, orange, and yellow colors in the left fMRI scan show the areas of the occipital lobe that are normally activated in response to faces. Blue and purple indicate the typical pattern of brain activity in response to objects. In contrast to a normally sighted individual, Mike's fMRI scan on the right shows virtually no response to faces and only slight brain activation in response to objects.

Nature Neuroscience (2003) Vol. 6 No. 9 915-916, Page 916, Figure 1, Letters to Nature, Visual perception after visual deprivation, Author's Ione Fine, Alex R. Wade, Alyssa Brewer, Michael G. May, Daniel F. Goodman, Geoffrey M. Boynton, Brian A. Wandell & Donald A. MacLeod (2003)



When Red + Blue + Green = White

When light waves of different wavelengths are combined, the wavelengths are added together, producing the perception of a different color. Thus, when green light is combined with red light, yellow light is produced. When the wavelengths of red, green, and blue light are added together, we perceive the blended light as white. If you're wondering why mixing paints together produces a muddy mess rather than pure white, it's because the wavelengths are *subtracted* rather than added. Each color of pigment absorbs a different part of the color spectrum, and each time a color is added, less light is reflected. Thus, the mixed color appears darker. If you mix all three primary colors together, they absorb the entire spectrum—so we perceive the splotch as black.

Color Vision

We see images of an apple, a banana, and an orange because these objects reflect light waves. But why do we perceive that the apple is red and the banana yellow? What makes an orange orange?

The Experience of Color

What Makes an Orange Orange?

Color is *not* a property of an object, but a sensation perceived in the brain (Werner & others, 2007). To explain how we perceive color, we must return to the original visual stimulus—light.

Our experience of **color** involves three properties of the light wave. First, what we usually refer to as color is a property more accurately termed **hue.** Hue varies with the wavelength of light. Look again at Figure 3.2. *Different wavelengths correspond to our subjective experience of different colors.* Wavelengths of about 400 nanometers are perceived as violet. Wavelengths of about 700 nanometers are perceived as red. In between are orange, yellow, green, blue, and indigo.

Second, the **saturation,** or *purity,* of the color corresponds to the purity of the light wave. Pure red, for example, produced by a single wavelength, is more *saturated* than pink, which is produced by a combination of wavelengths (red plus white light). In everyday language, saturation refers to the richness of a color. A highly saturated color is vivid and rich; a less saturated color is faded and washed out.

The third property of color is **brightness,** or perceived intensity. Brightness corresponds to the amplitude of the light wave: the higher the amplitude, the greater the degree of brightness.

These three properties of color—hue, saturation, and brightness—are responsible for the amazing range of colors we experience. A person with normal color vision can discriminate from 120 to 150 color differences based on differences in hue, or wavelength, alone. When saturation and brightness are also factored in, we can potentially perceive millions of different colors (Bornstein & Marks, 1982).

Many people mistakenly believe that white light contains no color. White light actually contains all wavelengths, and thus all colors, of the visible part of the electromagnetic spectrum. A glass prism placed in sunlight creates a rainbow because it separates sunlight into all the colors of the visible light spectrum.

So we're back to the question: Why is an orange orange? Intuitively, it seems obvious that the color of any object is an inseparable property of the object—unless we spill paint or spaghetti sauce on it. In reality, *color is a sensation perceived in the brain* (Werner & others, 2007).

Our perception of color is primarily determined by the wavelength of light that an object reflects. If your T-shirt is red, it's red because the cloth is *reflecting* only the wavelength of light that corresponds to the red portion of the spectrum. The T-shirt is *absorbing* the wavelengths that correspond to all other colors. An object appears white because it *reflects* all the wavelengths of visible light and absorbs none. An object appears black when it *absorbs* all the wavelengths of visible light and reflects none. Of course, in everyday life, our perceptions of color are also strongly affected by the amount or type of light falling on an object or the textures and colors that surround it (Purves, 2009; Shevell & Kingdom, 2008).

How We See Color

Color vision has interested scientists for hundreds of years. The first scientific theory of color vision, proposed by Hermann von Helmholtz (1821–1894) in the mid-1800s, was called the *trichromatic theory.* A rival theory, the *opponent-process theory,* was proposed in the late 1800s. Each theory was capable of explaining some aspects

color The perceptual experience of different wavelengths of light, involving hue, saturation (purity), and brightness (intensity).

hue The property of wavelengths of light known as color; different wavelengths correspond to our subjective experience of different colors.

saturation The property of color that corresponds to the purity of the light wave.

brightness The perceived intensity of a color, which corresponds to the amplitude of the light wave.

trichromatic theory of color vision The theory that the sensation of color results because cones in the retina are especially sensitive to red light (long wavelengths), green light (medium wavelengths), or blue light (short wavelengths).

color blindness One of several inherited forms of color deficiency or weakness in which an individual cannot distinguish between certain colors.

afterimage A visual experience that occurs after the original source of stimulation is no longer present.

opponent-process theory of color vision The theory that color vision is the product of opposing pairs of color receptors, red-green, blue-yellow, and black-white; when one member of a color pair is stimulated, the other member is inhibited.

of color vision, but neither theory could explain all aspects of color vision. Technological advances in the last few decades have allowed researchers to gather direct physiological evidence to test both theories. The resulting evidence indicates that *both* theories of color vision are accurate. Each theory describes color vision at a different stage of visual processing (Hubel, 1995).

The Trichromatic Theory As you'll recall, only the cones are involved in color vision. According to the **trichromatic theory of color vision,** there are three varieties of cones. Each type of cone is especially sensitive to certain wavelengths—red light (long wavelengths), green light (medium wavelengths), or blue light (short wavelengths). For the sake of simplicity, we will refer to red-sensitive, green-sensitive, and blue-sensitive cones, but keep in mind that there is some overlap in the wavelengths to which a cone is sensitive (Purves, 2009). A given cone will be very sensitive to one of the three colors and only slightly responsive to the other two.

When a color other than red, green, or blue strikes the retina, it stimulates a *combination* of cones. For example, if yellow light strikes the retina, both the red-sensitive and green-sensitive cones are stimulated; purple light evokes strong reactions from red-sensitive and blue-sensitive cones. The trichromatic theory of color vision received compelling research support in 1964, when George Wald showed that different cones were indeed activated by red, blue, and green light.

The trichromatic theory provides a good explanation for the most common form of **color blindness:** red–green color blindness. People with red–green color blindness cannot discriminate between red and green. That's because they have normal blue-sensitive cones, but their other cones are *either* red-sensitive or green-sensitive (Carroll & others, 2009). Thus, red and green look the same to them. Because red–green color blindness is so common, stoplights are designed so that the location of the light as well as its color provides information to drivers. In vertical stoplights the red light is always on top, and in horizontal stoplights the red light is always on the far left.

The Opponent-Process Theory The trichromatic theory cannot account for all aspects of color vision. One important phenomenon that the theory does not explain is the afterimage. An **afterimage** is a visual experience that occurs after the original source of stimulation is no longer present. To experience an afterimage firsthand, follow the instructions in Figure 3.6. What do you see?

Afterimages can be explained by the opponent-process theory of color vision, which proposes a different mechanism of color detection from the one set forth in the trichromatic theory. According to the **opponent-process theory of color vision,** there are four basic colors, which are divided into two pairs of color-sensitive neurons: red–green and blue–yellow. The members of each pair *oppose* each other. If red is stimulated, green is inhibited; if green is stimulated, red is inhibited. Green and red cannot both be stimulated simultaneously. The same is true for the blue–yellow



(both) Sue Cunningham Photographic/Alamy

The Most Common Form of Color Blindness To someone with the most common form of red–green color blindness, these two photographs look almost exactly the same. People with this type of color blindness have normal blue-sensitive cones, but their other cones are sensitive to either red *or* green. Because of the way red–green color blindness is genetically transmitted, it is much more common in men than in women. About 8 percent of the male population is born with red–green color deficiency, and about a quarter of these males experience only the colors coded by the blue/yellow cones. People who are completely color blind and see the world only in shades of black, white, and gray are extremely rare (Shevell & Kingdom, 2008).



FIGURE 3.6 Experiencing an Afterimage Stare at the white dot in the center of this oddly colored flag for about 30 seconds, and then look at a white wall or white sheet of paper. What do you see?

pair. In addition, black and white act as an opposing pair. Color, then, is sensed and encoded in terms of its proportion of red *or* green and blue *or* yellow.

For example, red light evokes a response of RED-YES–GREEN-NO in the red–green opponent pair. Yellow light evokes a response of BLUE-NO–YELLOW-YES. Colors other than red, green, blue, and yellow activate one member of each of these pairs to differing degrees. Purple stimulates the *red* of the red–green pair plus the *blue* of the blue–yellow pair. Orange activates *red* in the red–green pair and *yellow* in the blue–yellow pair.

Afterimages can be explained when the opponent-process theory is combined with the general principle of sensory adaptation (Jameson & Hurvich, 1989). If you stare continuously at one color, sensory adaptation eventually occurs and your visual receptors become less sensitive to that color. What happens when you subsequently stare at a white surface?

If you remember that white light is made up of the wavelengths for *all* colors, you may be able to predict the result. The receptors for the original color have adapted to the constant stimulation and are temporarily "off duty." Thus they do not respond to that color. Instead, only the receptors for the opposing color will be activated, and you perceive the wavelength of only the *opposing* color. For example, if you stare at a patch of green, your green receptors eventually become "tired." The wavelengths for both green and red light are reflected by the white surface, but since the green receptors are "off," only the red receptors are activated. Staring at the green, black, and yellow flag in Figure 3.6 should have produced an afterimage of opposing colors: a red, white, and blue American flag.

An Integrated Explanation of Color Vision At the beginning of this section we said that current research has shown that *both* the trichromatic theory and the opponent-process theory of color vision are accurate. How can both theories be right? It turns out that each theory correctly describes color vision at a *different level* of visual processing.

As described by the *trichromatic theory,* the cones of the retina do indeed respond to and encode color in terms of red, green, and blue. But recall that signals from the cones and rods are partially processed in the ganglion cells before being transmitted along the optic nerve to the brain. Researchers now believe that an additional level of color processing takes place in the ganglion cells (Demb & Brainard, 2010).

As described by the *opponent-process theory,* the ganglion cells respond to and encode color in terms of opposing pairs (DeValois & DeValois, 1975; Solomon & Lennie, 2007). In the brain, the thalamus and visual cortex also encode color in terms of opponent pairs. Consequently, both theories contribute to our understanding of the process of color vision. Each theory simply describes color vision at a different stage of visual processing (Hubel, 1995; Werner & others, 2007).

CONCEPT REVIEW 3.1

Principles of Sensation and Vision

Fill in the missing words to complete each statement.

1. Sensory receptors convert different forms of physical energy into neural signals through the process of _____.

2. The sensory receptors for vision are contained in the _____.

3. Complete the sequence of visual information transmission: rods and cones, _____ cells, _____ cells, optic nerve, _____, thalamus, _____.

4. According to the _____ theory of color vision, the person with red–green color blindness has normal blue-sensitive cones.

5. When people stare at a yellow circle and then shift their eyes to a white surface, the afterimage of the circle appears _____. This phenomenon can best be explained by the _____ theory of color vision.

Hearing

From Vibration to Sound

KEY THEME

› Auditory sensation, or hearing, results when sound waves are collected in the outer ear, amplified in the middle ear, and converted to neural messages in the inner ear.

KEY QUESTIONS

› How do sound waves produce different auditory sensations?

› What are the key structures of the ear and their functions?

› How do place theory and frequency theory explain pitch perception?

We have hiked in a desert area that was so quiet we could hear the whir of a single grasshopper's wings in the distance. And we have waited on a subway platform where the screech of metal wheels against metal rails forced us to cover our ears.

The sense of hearing, or **audition,** is capable of responding to a wide range of sounds, from faint to blaring, simple to complex, harmonious to discordant. The ability to sense and perceive very subtle differences in sound is important to physical survival, social interactions, and language development. Most of the time, all of us are bathed in sound—so much so that moments of near-silence, like our experience in the desert, can seem almost eerie.

audition The technical term for the sense of hearing.

loudness The intensity (or amplitude) of a sound wave, measured in decibels.

amplitude The intensity or amount of energy of a wave, reflected in the height of the wave; the amplitude of a sound wave determines a sound's loudness.

decibel (DESS-uh-bell) The unit of measurement for loudness.

pitch The relative highness or lowness of a sound, determined by the frequency of a sound wave.

frequency The rate of vibration, or the number of sound waves per second.

timbre (TAM-ber) The distinctive quality of a sound, determined by the complexity of the sound wave.

What We Hear

The Nature of Sound

Whether it's the ear-splitting screech of metal on metal or the subtle whir of a grasshopper's wings, *sound waves* are the physical stimuli that produce our sensory experience of sound. Usually, sound waves are produced by the rhythmic vibration of air molecules, but sound waves can be transmitted through other media, such as water, too. Our perception of sound is directly related to the physical properties of sound waves (see Figure 3.7).

One of the first things that we notice about a sound is how loud it is. **Loudness** is determined by the intensity, or **amplitude,** of a sound wave and is measured in units called **decibels.** Zero decibels represents the loudness of the softest sound that humans can hear, or the absolute threshold for hearing. As decibels increase, perceived loudness increases.

Pitch refers to the relative "highness" or "lowness" of a sound. Pitch is determined by the frequency of a sound wave. **Frequency** refers to the rate of vibration, or number of waves per second, and is measured in units called *hertz.* Hertz simply refers to the number of wave peaks per second. The faster the vibration, the higher the frequency, the closer together the waves are—and the higher the tone produced. If you pluck the high E and the low E strings on a guitar, you'll notice that the low E vibrates far fewer times per second than does the high E.

Most of the sounds we experience do not consist of a single frequency but are *complex,* consisting of several sound-wave frequencies. This combination of frequencies produces the distinctive quality, or **timbre,** of a sound, which enables us to distinguish easily between the same note played on a saxophone and on a piano. Every human voice has its own distinctive timbre, which is why you can immediately identify a friend's voice on the telephone from just a few words, even if you haven't talked to each other for years.

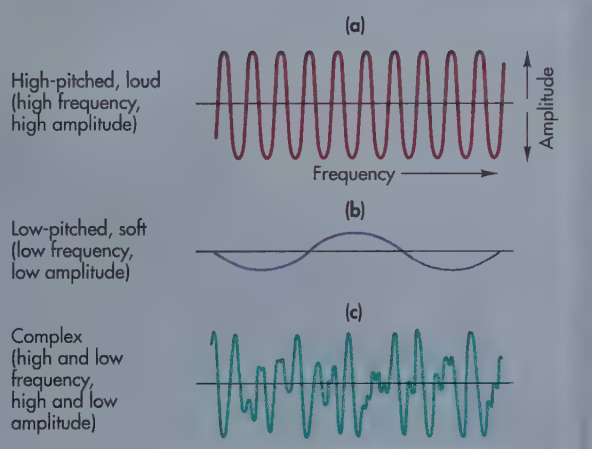


FIGURE 3.7 Characteristics of Sound Waves The length of a wave, its height, and its complexity determine the loudness, pitch, and timbre that we hear. The sound produced by **(a)** would be high-pitched and loud. The sound produced by **(b)** would be soft and low. The sound in **(c)** is complex, like the sounds we usually experience in the natural world.

outer ear The part of the ear that collects sound waves; consists of the pinna, the ear canal, and the eardrum.

eardrum A tightly stretched membrane at the end of the ear canal that vibrates when hit by sound waves.

middle ear The part of the ear that amplifies sound waves; consists of three small bones: the hammer, the anvil, and the stirrup.

How We Hear

The Path of Sound

The ear is made up of the outer ear, the middle ear, and the inner ear. Sound waves are *collected* in the outer ear, *amplified* in the middle ear, and *transduced,* or *transformed into neural messages,* in the inner ear (see Figure 3.8).

The **outer ear** includes the *pinna,* the *ear canal,* and the *eardrum.* The pinna is that oddly shaped flap of skin and cartilage that's attached to each side of your head. The pinna helps us pinpoint the location of a sound. But the pinna's primary role is to catch sound waves and funnel them into the ear canal. The sound wave travels down the ear canal, then bounces into the **eardrum,** a tightly stretched membrane. When the sound wave hits the eardrum, the eardrum vibrates, matching the vibrations of the sound wave in intensity and frequency.

The eardrum separates the outer ear from the **middle ear.** The eardrum's vibration is transferred to three tiny bones in the middle ear—the *hammer,* the *anvil,* and the *stirrup.* Each bone sets the next bone in motion. The joint action of these three bones almost doubles the amplification of the sound. The innermost bone, the stirrup, transmits the amplified vibration to the *oval window.* If the tiny bones of the middle ear are

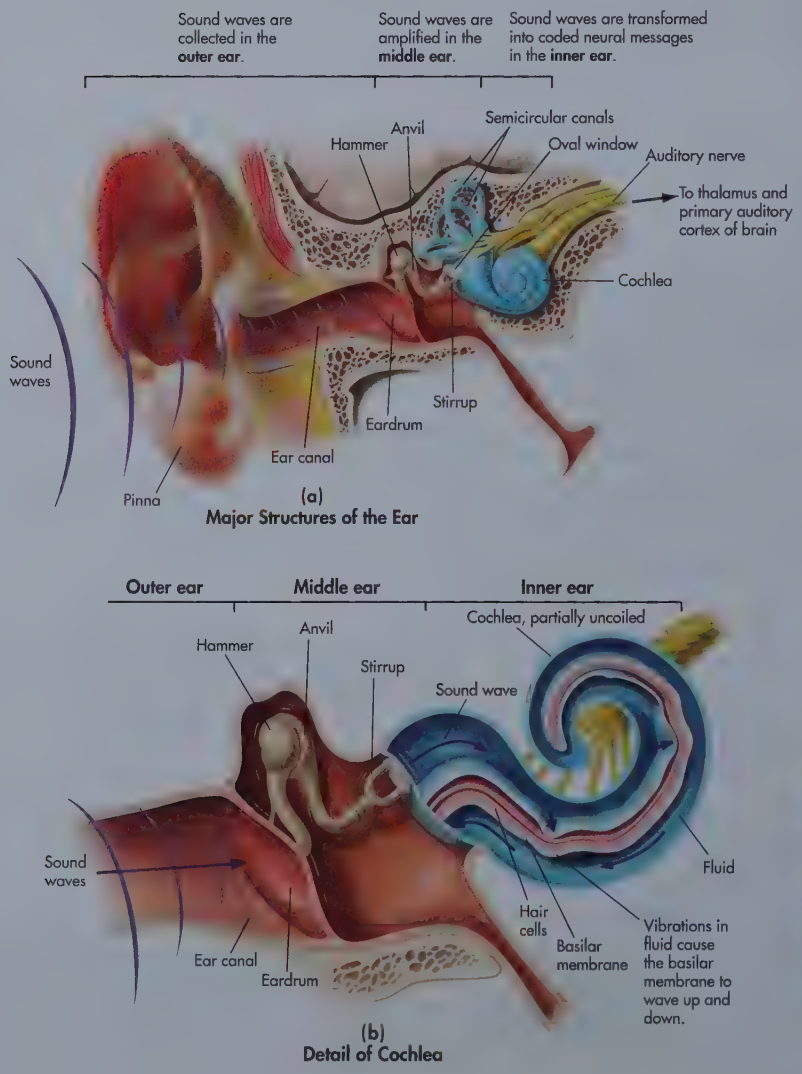


FIGURE 3.8 The Path of Sound Through the Human Ear The path that sound waves take through the major structures of the human ear is shown in **(a).** After being caught by the outer ear, sound waves are funneled down the ear canal to the eardrum, which transfers the vibrations to the structures of the middle ear. In the middle ear, the vibrations are amplified and transferred in turn to the oval window and on to the fluid-filled cochlea in the inner ear **(b).** As the fluid in the cochlea vibrates, the basilar membrane ripples, bending the hair cells, which appear as rows of yellow tips in the top right section of the color-enhanced scanning electromicrograph **(c).** The bending of the hair cells stimulates the auditory nerve, which ultimately transmits the neural messages to the auditory cortex in the brain.



G. Bredegr/Photo Researchers

(c)

TABLE 3.2

Decibel Level of Some Common Sounds

Decibels	Examples	Exposure Danger
180	Rocket launching pad	Hearing loss inevitable
140	Shotgun blast, jet plane	Any exposure is dangerous
120	Speakers at rock concert, sandblasting, thunderclap	Immediate danger
100	Chain saw, pneumatic drill	2 hours
90	Truck traffic, noisy home appliances, lawn mower	Less than 8 hours
80	Subway, heavy city traffic, alarm clock at 2 feet	More than 8 hours
70	Busy traffic, noisy restaurant	Critical level begins with constant exposure
60	Air conditioner at 20 feet, conversation, sewing machine	
50	Light traffic at a distance, refrigerator	
40	Quiet office, living room	
30	Quiet library, soft whisper	
0	Lowest sound audible to human ear	

damaged or become brittle, as they sometimes do in old age, *conduction deafness* may result. Conduction deafness can be helped by a hearing aid, which amplifies sounds.

Like the eardrum, the oval window is a membrane, but it is many times smaller than the eardrum. The oval window separates the middle ear from the **inner ear.** As the oval window vibrates, the vibration is next relayed to an inner structure called the **cochlea,** a fluid-filled tube that's coiled in a spiral. The word *cochlea* comes from the Greek word for "snail," and the spiral shape of the cochlea does resemble a snail's shell. Although the cochlea is a very complex structure, it is quite tiny—no larger than a pea.

As the fluid in the cochlea ripples, the vibration in turn is transmitted to the **basilar membrane,** which runs the length of the coiled cochlea. Embedded in the basilar membrane are the sensory receptors for sound, called **hair cells,** which have tiny, projecting fibers that look like hairs. Damage to the hair cells or auditory nerve can result in *nerve deafness,* which cannot be helped by a hearing aid. Exposure to loud noise can cause nerve deafness (see Table 3.2).

The hair cells bend as the basilar membrane ripples. It is here that transduction finally takes place: The physical vibration of the sound waves is converted into neural impulses. As the hair cells bend, they stimulate the cells of the auditory nerve, which carries the neural information to the thalamus and the auditory cortex in the brain (Hackett & Kaas, 2009; Recanzone & Sutter, 2008).

Distinguishing Pitch

How do we distinguish between the low-pitched throb of a bass guitar and the high-pitched tones of a piccolo? Remember, pitch is determined by the *frequency* of a sound wave. The basilar membrane is a key structure involved in our discrimination of pitch. Two complementary theories describe the role of the basilar membrane in the transmission of differently pitched sounds.

According to **frequency theory,** the basilar membrane vibrates at the *same* frequency as the sound wave. Thus, a sound wave of about 100 hertz would excite each hair cell along the basilar membrane to vibrate 100 times per second, and neural impulses would be sent to the brain at the same rate. However, there's a limit to how fast neurons can fire. Individual neurons cannot fire faster than about 1,000 times per second. But we can sense sounds with frequencies that are many times higher than 1,000 hertz. A child, for example, can typically hear pitches ranging from about

inner ear The part of the ear where sound is transduced into neural impulses; consists of the cochlea and semicircular canals.

cochlea (COCK-lee-uh) The coiled, fluid-filled inner-ear structure that contains the basilar membrane and hair cells.

basilar membrane (BAZ-uh-ler or BAZE-uh-ler) The membrane within the cochlea of the ear that contains the hair cells.

hair cells The hair-like sensory receptors for sound, which are embedded in the basilar membrane of the cochlea.

frequency theory The view that the basilar membrane vibrates at the same frequency as the sound wave.



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Bickwinkel/Alamy

Can Snakes Hear? Snakes have functional inner ears, but they don't have outer ears. So how do snakes hear? With their jaws. When a desert viper rests its head on the ground, a bone in its jaw picks up minute vibrations in the sand. From the jaw, these vibrations are transmitted along a chain of tiny bones to the cochlea in the inner ear, allowing the snake to "hear" the faint footsteps of a mouse or other prey (Freidel & others, 2008). Similarly, in some species of salamanders, frogs, toads, and lizards, vibrations in the air are picked up by the lungs and transmitted to functional inner ears.

20 to 20,000 hertz. Frequency theory explains how low-frequency sounds are transmitted to the brain, but it cannot explain the transmission of higher-frequency sounds.

So how do we distinguish higher-pitched sounds? According to **place theory,** different frequencies cause larger vibrations at different *locations* along the basilar membrane. High-frequency sounds, for example, cause maximum vibration near the stirrup end of the basilar membrane. Lower-frequency sounds cause maximum vibration at the opposite end. Thus, different pitches excite different hair cells along the basilar membrane. Higher-pitched sounds are interpreted according to the place where the hair cells are most active.

Both frequency theory and place theory are involved in explaining our discrimination of pitch. Frequency theory helps explain our discrimination of frequencies lower than 500 hertz. Place theory helps explain our discrimination of higher-pitched sounds. For intermediate frequencies or midrange pitches, both place and frequency are involved.

The Chemical and Body Senses

Smell, Taste, Touch, and Position

KEY THEME

› Chemical stimuli produce the sensations of smell and taste, while pressure and other stimuli are involved in touch, pain, position, and balance sensations.

KEY QUESTIONS

› How do airborne molecules result in the sensation of an odor?

› What are the primary tastes, and how does the sensation of taste arise?

› How do fast and slow pain systems differ, and what is the gate-control theory of pain?

› How are body sensations of movement, position, and balance produced?

The senses of smell and taste are closely linked. If you've ever temporarily lost your sense of smell because of a bad cold, you've probably noticed that your sense of taste was also disrupted. Even a hot fudge sundae tastes bland.

Smell and taste are linked in other ways, too. Unlike vision and hearing, which involve sensitivity to different forms of energy, the sensory receptors for taste and smell are specialized to respond to different types of *chemical* substances. That's why smell, or **olfaction,** and taste, or **gustation,** are sometimes called the "chemical senses" (Travers & Travers, 2009).

Smell, Taste, and the Eight Million Dollar Nose According to Dutch winemaker Ilja Gort, "Tasting wine is something you do with your nose, not your mouth." Wine connoisseurs are keenly aware of the fact that the senses of smell and taste are closely intertwined. Specialized receptors in the nasal passages are able to detect the subtle aromas that differentiate among fine wines (Simons & Noble, 2003; Spence, 2010). After hearing about a man who lost his sense of smell in an auto accident, Dutch winemaker Ilja Gort approached Lloyd's of London about insuring his nose—for $8 million. After a thorough examination, Lloyd's agreed, but with a few conditions. Gort is not allowed to box, ride a motorcycle, or have his moustache trimmed by anyone other than an experienced barber.



Photographed by Krijn van Noordwijk. Supplied courtesy of Lloyd's of London by permission of Ilja Gort.

People can get along quite well without a sense of smell. A surprisingly large number of people are unable to smell specific odors or lack a sense of smell completely, a condition called *anosmia.* Fortunately, humans gather most of their information about the world through vision and hearing. However, many animal species depend on chemical signals as their primary source of information.

Even for humans, smell and taste can provide important information about the environment. Tastes help us determine whether a particular substance is to be savored or spat out. Smells, such as the odor of a smoldering fire, leaking gas, or spoiled food, alert us to potential dangers.

How We Smell (Don't Answer That!)

The sensory stimuli that produce our sensation of an odor are *molecules in the air.* These airborne molecules are emitted by the substance we are smelling. We inhale them through the nose and through the opening in the palate at the back of the throat. In the nose, the molecules encounter millions of *olfactory receptor cells* located high in the nasal cavity.

Unlike the sensory receptors for hearing and vision, the olfactory receptors are constantly being replaced. Each cell lasts for only about 30 to 60 days. Neuroscientists Linda Buck and Richard Axel won the 2004 Nobel Prize for their identification of the odor receptors that are present on the hair-like fibers of the olfactory neurons. Like synaptic receptors, each odor receptor seems to be specialized to respond to molecules of a different chemical structure. When these olfactory receptor cells are stimulated by the airborne molecules, the stimulation is converted into neural messages that pass along their axons, bundles of which make up the *olfactory nerve.*

So far, hundreds of different odor receptors have been identified (Gottfried, 2010). We don't have a separate receptor for each of the estimated 10,000 different odors that we can detect, however. Rather, each receptor is like a letter in an olfactory alphabet. Just as different combinations of letters in the alphabet are used to produce recognizable words, different combinations of olfactory receptors produce the sensation of distinct odors. Thus, the airborne molecules activate specific combinations of receptors. In turn, the brain identifies an odor by interpreting the *pattern* of olfactory receptors that are stimulated (Shepherd, 2006).

As shown in Figure 3.9, the olfactory nerves directly connect to the **olfactory bulb** in the brain, which is actually the enlarged ending of the *olfactory cortex* at the front of the brain. Axons from the olfactory bulb form the *olfactory tract.* These neural pathways project to different brain areas, including the temporal lobe and structures in the limbic system (Gottfried, 2010; Shepherd, 2006). The projections to the *temporal lobe* are thought to be part of the neural pathway involved in our conscious recognition of smells. The projections to the *limbic system* are thought to regulate our emotional response to odors.

The direct connection of olfactory receptor cells to areas of the cortex and limbic system is unique to our sense of smell. As discussed in Chapter 2, all other bodily sensations are first processed in the thalamus before being relayed to the higher brain

place theory The view that different frequencies cause larger vibrations at different locations along the basilar membrane.

olfaction Technical name for the sense of smell.

gustation Technical name for the sense of taste.

olfactory bulb (ole-FACK-toe-ree) The enlarged ending of the olfactory cortex at the front of the brain where the sensation of smell is registered.

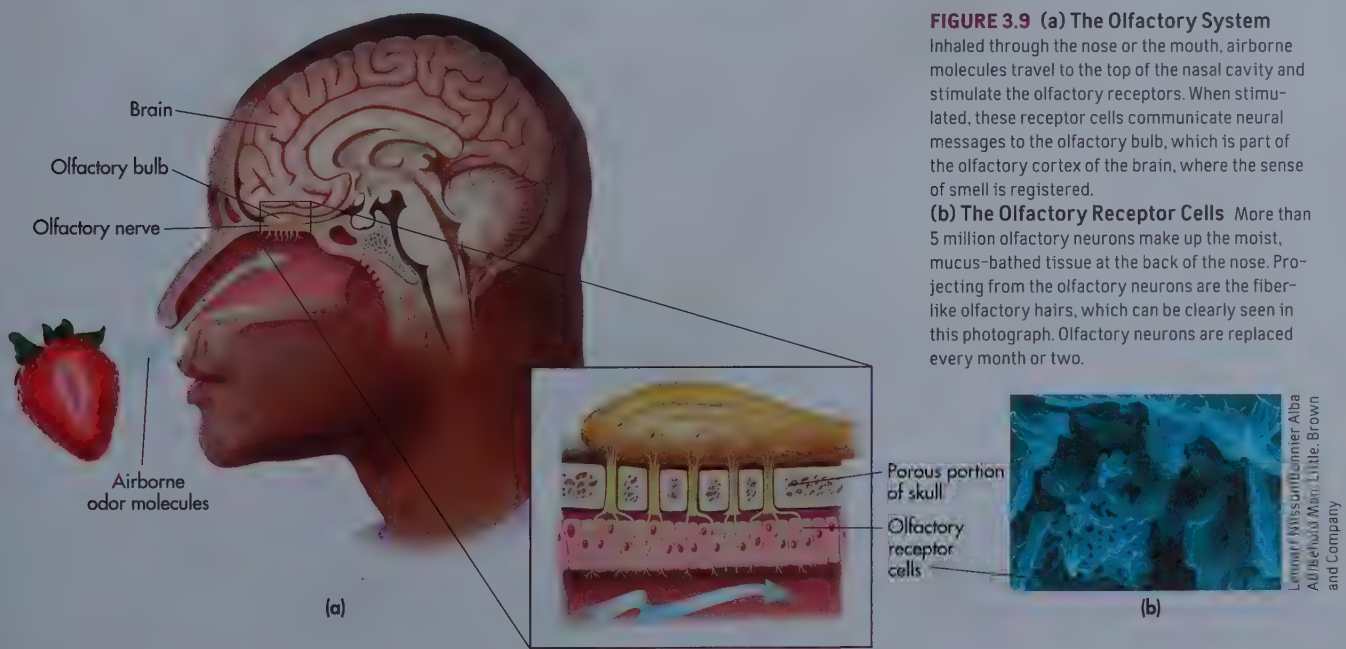


FIGURE 3.9 (a) The Olfactory System Inhaled through the nose or the mouth, airborne molecules travel to the top of the nasal cavity and stimulate the olfactory receptors. When stimulated, these receptor cells communicate neural messages to the olfactory bulb, which is part of the olfactory cortex of the brain, where the sense of smell is registered.

(b) The Olfactory Receptor Cells More than 5 million olfactory neurons make up the moist, mucus-bathed tissue at the back of the nose. Projecting from the olfactory neurons are the fiber-like olfactory hairs, which can be clearly seen in this photograph. Olfactory neurons are replaced every month or two.

Lennart Nilsson/Bonnier Alba AB/Behold Man, Little, Brown and Company

IN FOCUS

Do Pheromones Influence Human Behavior?

Many animals communicate by releasing **pheromones**, chemical signals that provide information about social and sexual status to other members of the same species (Swaney & Keverne, 2009; Tirindelli & others, 2009). Pheromones may mark territories and serve as warning signals to other members of the same species. Ants use pheromones to mark trails for other ants, as do snakes and snails. Pheromones are also extremely important in regulating sexual attraction, mating, and reproductive behavior in many animals (Wyatt, 2009). A lusty male cabbage moth, for example, can detect pheromones released from a sexually receptive female cabbage moth that is several miles away.

Do humans produce pheromones as other animals do? The best evidence for the existence of human pheromones comes from studies of the female menstrual cycle by University of Chicago biopsychologist Martha McClintock (1992). While still a college student, McClintock (1971) set out to scientifically investigate the folk notion that women who live in the same dorm eventually develop synchronized menstrual periods. McClintock was able to show that the more time women spent together, the more likely their cycles were to be in sync.

Later research showed that smelling an unknown chemical substance in underarm sweat from female donors synchronized the recipients' menstrual cycles with the donors' cycles (Preti & others, 1986; Stern & McClintock, 1998).

Since this finding, McClintock and her co-researchers have made a number of discoveries in their quest to identify human pheromones, which they prefer to call *human chemosignals*. Their search has narrowed to chemicals found in steroid compounds that are naturally produced by the human body and found in sweat, arm pit hair, blood, and semen. One study in McClintock's lab showed that exposure to a chemical compound in the perspiration of breast-feeding mothers significantly increased sexual motivation in other, non-breast-feeding women (Spencer & others, 2004). The study's authors speculate that the presence of breast-feeding women acts as a social signal—an indicator that the social and physical environment is one in which pregnancy and breast-feeding will be supported.



Paul Bradbury/Photolibrary

The Scent of Attraction Some perfume manufacturers claim that their products contain human pheromones that will make you "irresistible" to members of the opposite sex. But is there any evidence that pheromones affect human sexual attraction?

Rather than producing sexual attraction, McClintock (2004) believes, it's more likely that human chemosignals affect mood and emotional states. One recent example is the surprising finding that exposure to women's tears reduced sexual motivation, sexual arousal, and testosterone levels in men (Geltstein & others, 2011; Stern, 2011).

Despite such intriguing findings, *no* study has shown that human chemosignals can function as an irresistible sexual signal (Brennan & Zufall, 2006). Rather than triggering specific behaviors, including sexual behavior, human chemosignals may be social signals, subliminally affecting social interactions and relationships in ways that we don't consciously recognize.

centers in the cortex. Olfactory neurons are unique in another way, too. They are the only neurons that *directly* link the brain and the outside world. The axons of the sensory neurons that are located in your nose extend directly into your brain!

As with the other senses, we experience sensory adaptation to odors when exposed to them for a period of time. In general, we reach maximum adaptation to an odor in less than a minute. We continue to smell the odor, but we have become about 70 percent less sensitive to it.

Olfactory function tends to decline with age. About half of those aged 65 to 80 have a significant loss of olfactory function, a number that increases to two-thirds of people aged 80 and above (Lafreniere & Mann, 2009; Rawson, 2006). At any age, air pollution, smoking, and exposure to some industrial chemicals can decrease the ability to smell. Loss of olfactory function is also associated with several diseases—including Parkinson's disease, schizophrenia, and multiple sclerosis—and may be an early marker of Alzheimer's disease (Wang others, 2010; Wilson & others, 2009).

Although humans are highly sensitive to odors, many animals display even greater sensitivity. Dogs, for example, have about 200 million olfactory receptor cells, compared with the approximately 12 million receptors that humans have (Sela & Sobel, 2010). However, humans are more sensitive to smell than most people realize (Shepherd, 2004).

pheromones Chemical signals released by an animal that communicate information and affect the behavior of other animals of the same species.

taste buds The specialized sensory receptors for taste that are located on the tongue and inside the mouth and throat.

In fact, people can train their sense of smell (see photo). In a fascinating study, Wen Li and her colleagues (2006) showed that with repeated exposure to a particular class of odors (floral or minty), participants improved in their ability to distinguish subtle differences among the different scents. They also became more sensitive to the odors. These behavioral changes were accompanied by changes in the brain: fMRI scans showed increased activation in the olfactory cortex. The moral? Stop and smell the flowers often enough, and you will improve your ability to discriminate a geranium from a marigold.



Courtesy of Noam Sobel

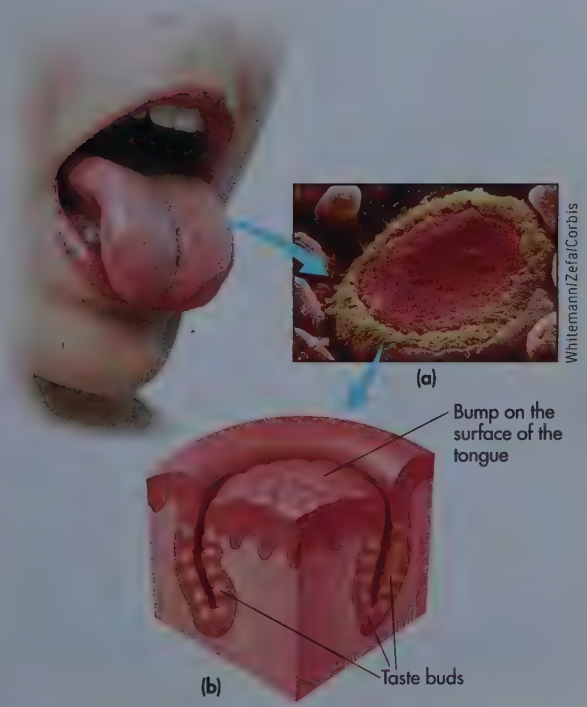
Can Humans Track a Scent? Dogs are famous for their ability to track a scent. Humans? Not so much. However, it turns out that people are better trackers than you might think. Berkeley scientist Jess Porter and colleagues (2007) embedded a long line of chocolate-scented twine into the ground and then tested whether human undergraduates could find and track the scent using their olfactory sense alone. To block all other sensory cues, the college students wore opaque eye masks, earmuffs, and thick knee pads, elbow pads, and work gloves. Although the human trackers were able to locate and follow the trail, their average speed was only about one inch per second. However, after only a few days of practice, the trackers' speed doubled, improving to two inches per second.

Taste

Our sense of taste, or *gustation,* results from the stimulation of special receptors in the mouth. The stimuli that produce the sensation of taste are chemical substances in whatever you eat or drink. These substances are dissolved by saliva, allowing the chemicals to activate the **taste buds.** Each taste bud contains about 50 receptor cells that are specialized for taste.

The surface of the tongue is covered with thousands of little bumps with grooves in between (see Figure 3.10). These grooves are lined with the taste buds. Taste buds are also located on the insides of your cheeks, on the roof of your mouth, and in your throat. Each taste bud shows maximum sensitivity to one particular taste and lesser sensitivity to other tastes (Chandrashekar & others, 2006). When activated, special receptor cells in the taste buds send neural messages along pathways to the thalamus in the brain. In turn, the thalamus directs the information to several regions in the cortex (Shepherd, 2006).

There were long thought to be four basic taste categories: sweet, salty, sour, and bitter. However, scientists identified the receptor cells for a fifth basic taste, *umami* (Chaudhari & others, 2000). Loosely translated, *umami* means "yummy" or "delicious" in Japanese. *Umami* is the distinctive taste of monosodium glutamate and is associated with meat and other protein-rich foods. It's also responsible for the savory flavor of Parmesan and other aged cheeses, mushrooms, and seaweed.



Whitemann/Zefa/Corbis

FIGURE 3.10 Taste Buds Contrary to popular belief, it's long been known that there is no tongue "map" in which different regions of the tongue are responsive to different tastes. Instead, responsiveness to the five basic tastes is present in all tongue areas (Chandrashekar & others, 2006). **(a)** The photograph shows the surface of the tongue magnified hundreds of times. Taste buds are located in the grooves of the bumps on the surface of the tongue. **(b)** Embedded in the surface of the tongue are thousands of taste buds, the sensory receptor organs for taste. Each taste bud contains an average of 50 taste receptor cells. When activated, the taste receptor cells send messages to adjoining sensory neurons, which relay the information to the brain. Taste buds, like the olfactory neurons, are constantly being replaced. The life expectancy of a particular taste bud is only about 10 days.



Fox Searchlight/Photofest

Expensive Taste Nominated for several Oscars, *Sideways* told the story of a wine connoisseur and his friend on a road trip through California wine country. Although wine experts may be able to discern subtle differences among wines, amateurs may not be as objective. To determine the effect of *price* on perceived quality, Hilke Plassmann and her colleagues (2008) asked participants to decide which tasted better: wine poured from a bottle labeled as costing $90 or from a bottle that cost $10. Although the wine in the two bottles was identical, participants overwhelmingly thought the $90 bottle tasted better. Their subjective, verbal rating was confirmed by brain scans: Activity in a brain region associated with pleasant sensations was much higher when they sipped the wine that they thought cost $90 a bottle than when they sipped the same wine from a bottle that supposedly cost $10. The moral: Many different factors affect taste, not the least of which is your expectation of just how good something is likely to taste.

From an evolutionary view, these five basic tastes supply the information we need to seek out nutrient-rich foods and avoid potentially hazardous substances (Chandrashekar & others, 2006; Eisenstein, 2010). Sweet tastes attract us to energy-rich foods, *umami* to protein-rich nutrients. Bitter or sour tastes warn us to avoid many toxic or poisonous substances (Peyrot des Gachons & others, 2011). Sensitivity to salty-tasting substances helps us regulate the balance of electrolytes in our diets.

Most tastes are complex and result from the activation of different combinations of basic taste receptors. Taste is just one aspect of *flavor,* which involves several sensations, including the aroma, temperature, texture, and appearance of food (Shepherd, 2006).

The Skin and Body Senses

While vision, hearing, smell, and taste provide you with important information about your environment, another group of senses provides you with information that comes from a source much closer to home: your own body. In this section, we'll first consider the *skin senses,* which provide essential information about your physical status and your physical interaction with objects in your environment. We'll next consider the *body senses,* which keep you informed as to your position and orientation in space.

Touch

We usually don't think of our skin as a sense organ. But the skin is in fact the largest and heaviest sense organ. The skin of an average adult covers about 20 square feet of surface area and weighs about six pounds.

There are many different kinds of sensory receptors in the skin. Some of these sensory receptors are specialized to respond to just one kind of stimulus, such as pressure, warmth, or cold (McGlone & Reilly, 2010). Other skin receptors respond to more than one type of stimulus (Delmas & others, 2011).

One important receptor involved with the sense of touch, called the *Pacinian corpuscle,* is located beneath the skin. When stimulated by pressure, the Pacinian corpuscle converts the stimulation into a neural message that is relayed to the brain. If a pressure is constant, sensory adaptation takes place. The Pacinian corpuscle either reduces the number of signals sent or quits responding altogether (which is fortunate, or you'd be unable to forget the fact that you're wearing underwear).

Sensory receptors are distributed unevenly among different areas of the body, which is why sensitivity to touch and temperature varies from one area of the body to another. Your hands, face, and lips, for example, are much more sensitive to touch than are your back, arms, and legs. That's because your hands, face, and lips are much more densely packed with sensory receptors.

Pain

From the sharp sting of a paper cut to the dull ache of a throbbing headache, a wide variety of stimuli can trigger pain. **Pain** can be defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Gatchel & others, 2011). As unpleasant as it can be, pain helps you survive. Pain warns you about potential or actual injury, prompting you to pay attention and stop what you are doing. Sudden pain can trigger the withdrawal reflex—you jerk back from the object or stimulus that is injuring you. (We discussed the withdrawal reflex and other spinal reflexes in Chapter 2.)

Your body's pain receptors are called **nociceptors.** Nociceptors are actually small sensory fibers, called *free nerve endings,* in the skin, muscles, or internal organs. You have millions of nociceptors throughout your body, mostly in your skin (see Table 3.3).

TABLE 3.3

Sensitivity of Different Body Areas to Pain

Most Sensitive	Least Sensitive
Back of the knee	Tip of the nose
Neck region	Sole of the foot
Bend of the elbow	Ball of the thumb

Source: Geldard (1972).

For example, your fingertips may have as many as 1,200 nociceptors per square inch. Your muscles and joints have fewer nociceptors, and your internal organs have the smallest number of nociceptors.

pain The unpleasant sensation of physical discomfort or suffering that can occur in varying degrees of intensity.

nociceptors Specialized sensory receptors for pain that are found in the skin, muscles, and internal organs.

substance P A neurotransmitter that is involved in the transmission of pain messages to the brain.

Fast and Slow Pain Systems To help illustrate pain pathways, imagine this scene: Don was trying to close a stuck window in our old house. As he wrapped his left hand on the top of the window and used his right hand to push down the lower edge, it suddenly came free and slammed shut, jamming his left fingertips between the upper and lower windows. As pain shot through him, he jerked the window back up to dislodge his mangled fingers, then headed to the kitchen for ice.

Don took little comfort in knowing that his injury had triggered two types of nociceptors: *A-delta fibers* and *C fibers*. The myelinated *A-delta fibers* represent the fast pain system. A-delta fibers transmit the sharp, intense, but short-lived pain of the immediate injury. The smaller, unmyelinated *C fibers* represent the slow pain system. As the sharp pain subsides, C fibers transmit the longer-lasting throbbing, burning pain of the injury (Guindon & Hohmann, 2009). The throbbing pain carried by the C fibers gradually diminishes as a wound heals over a period of days or weeks.

As shown in Figure 3.11, both the fast A-delta fibers and the slow C fibers transmit their messages to the spinal cord. Several neurotransmitters are involved in processing pain signals, but most C fibers produce a pain enhancer called substance P. **Substance P** stimulates free nerve endings at the site of the injury and also increases pain messages within the spinal cord (Rosenkranz, 2007).

Most of these messages from C fibers and A-delta fibers cross to the other side of the spinal cord, then to the brain. The fast pain messages travel to the thalamus, then to the somatosensory cortex, where the sensory aspects of the pain message are interpreted, such as the location and intensity of the pain. Interestingly, morphine and other opiates have virtually no effect on the fast pain system.

In contrast, slow pain messages follow a different route in the brain. From the spinal cord, the slow pain messages travel first to the hypothalamus and thalamus, and then to

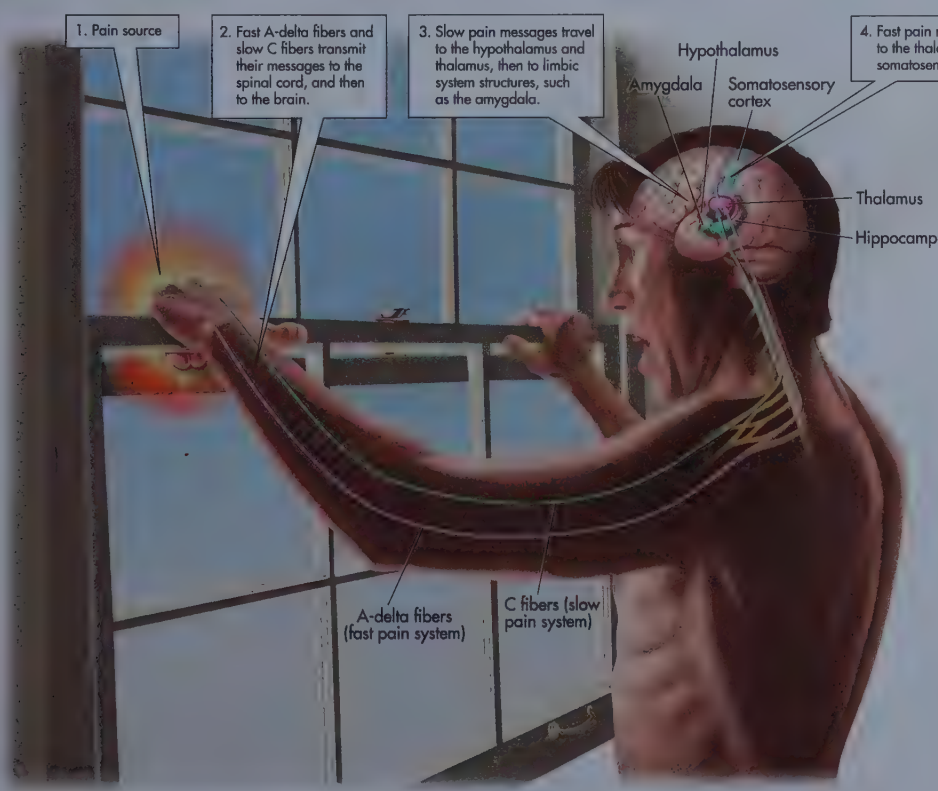


FIGURE 3.11 Fast and Slow Pain Pathways The fast pain pathway consists of myelinated A-delta fibers, shown in purple, which project first to the thalamus and then on to the somatosensory cortex. Signals carried along this pathway produce the sensory aspects of pain—the sharp but short-lived pain of an immediate injury. In contrast, the slow pain pathway consists of unmyelinated C fibers, shown in green. The slow pain pathway is much more involved with the emotional aspects of pain. The C fibers project to the thalamus and hypothalamus, then to limbic system structures, including the amygdala.

Photonica



Red-Headed Women and Pain Gender differences in pain have been extensively researched (Manson, 2010). In general, women are more sensitive to pain than men. Studies also show that women respond better than men to some morphine-like pain medications called *kappa opioids* (Fillingim & others, 2009). Research has found that a gene associated with red hair and fair skin was implicated in the response to these pain medications (Chakrabarti & others, 2010; Mogil & others, 2003). Women with two copies of this gene, like the three sisters in the photo here, experience much greater pain relief from kappa opioids than men or other women.

limbic system structures, such as the amygdala. Its connections to the limbic system suggest that the slow pain system is more involved in the emotional aspects of pain. Morphine and other opiates very effectively block painful sensations in the slow pain system (Guindon & Hohmann, 2009).

Factors That Influence Pain "Gates" There is considerable individual variation in the experience of pain (Edwards & others, 2009). When sensory pain signals reach the brain, the sensory information is integrated with psychological and situational information. According to the **gate-control theory of pain,** depending on how the brain interprets the pain experience, it regulates pain by sending signals down the spinal cord that either open or close pain "gates," or pathways (Melzack & Wall, 1965, 1996). If, because of psychological, social, or situational factors, the brain signals the gates to open, pain is experienced or intensified. If for any of the same reasons the brain signals the gates to close, pain is reduced.

Anxiety, fear, and a sense of helplessness are just a few of the psychological factors that can intensify the experience of pain (Edwards & others, 2009). So do feelings of depression and sadness (Berna & others, 2010). And, neuroscientists have found that manipulating people's moods by exposing them to different odors can affect their experience of pain (Villemure & Bushnell, 2009). Pleasant smells, like violets, evoke a good mood *and* a reduced sense of pain. But unpleasant smells, like rotten food, put people in a bad mood and heighten their sense of pain.

Along with good moods, a sense of control can reduce the perception of pain. As one example, consider the athlete who has conditioned himself to minimize pain during competition. The experience of pain is also influenced by social and situational factors, along with cultural beliefs about the meaning of pain and the appropriate response to pain (Gatchel & others, 2011). In the end-of-chapter section, Enhancing Well-Being with Psychology, we discuss some helpful strategies that you can use to minimize pain.

Psychological factors can also influence the release of *endorphins* and *enkephalins,* the body's natural painkillers (see Chapter 2). Endorphins and enkephalins are produced in the brain and spinal cord. They are released as part of the body's overall response to physical pain or stress. In the brain and spinal cord, endorphins and enkephalins inhibit the transmission of pain signals, including the release of substance P.

Sensitization: Unwarranted Pain One of the most frustrating aspects of pain management is that it can continue even after an injury has healed, such as after recovering from a spinal cord injury or severe burns. A striking example of this phenomenon is *phantom limb pain,* in which a person continues to experience intense painful sensations in a limb that has been amputated (Wolff & others, 2011).

How can phantom limb pain be explained? Basically, the neurons involved in processing the pain signals undergo *sensitization.* Earlier in the chapter, we discussed *sensory adaptation,* in which sensory receptors become gradually less responsive to steady stimulation over time. Sensitization is the opposite of adaptation. In sensitization, pain pathways in the brain become increasingly *more* responsive over time. It's like a broken volume control knob on your stereo that you can turn up, but not down or off.

As the pain circuits undergo sensitization, pain begins to occur in the absence of any sensory input. The result can be the development of persistent, *chronic pain* that continues after all indications are that the injury has healed (Wolff & others, 2011). In the case of phantom limb pain, sensitization has occurred in the pain transmission pathways from the site of the amputation. The sensitized pathways produce painful sensations that mentally feel as though they are coming from a limb that is no longer there.

Movement, Position, and Balance

The phone rings. Without looking up from your textbook, you reach for the phone, pick it up, and guide it to the side of your head. You have just demonstrated your **kinesthetic sense**—the sense that involves the location and position of body parts in relation to one another. (The word *kinesthetics* literally means "feelings of motion.") The kinesthetic sense involves specialized sensory neurons, called **proprioceptors,**

gate-control theory of pain The theory that pain is a product of both physiological and psychological factors that cause spinal gates to open and relay patterns of intense stimulation to the brain, which perceives them as pain.

kinesthetic sense (kin-ess-THET-ick) The technical name for the sense of location and position of body parts in relation to one another.

proprioceptors (pro-pree-oh-SEP-ters) Sensory receptors, located in the muscles and joints, that provide information about body position and movement.

vestibular sense (vess-TIB-you-ler) The technical name for the sense of balance, or equilibrium.

which are located in the muscles and joints. The proprioceptors constantly communicate information to the brain about changes in body position and muscle tension.

Closely related to the kinesthetic sense is the **vestibular sense,** which provides a sense of balance, or equilibrium, by responding to changes in gravity, motion, and body position. The two sources of vestibular sensory information, the *semicircular canals* and the *vestibular sacs,* are both located in the ear (see Figure 3.12). These structures are filled with fluid and lined with hair-like receptor cells that shift in response to motion, changes in body position, or changes in gravity (Eatock & Songer, 2011).

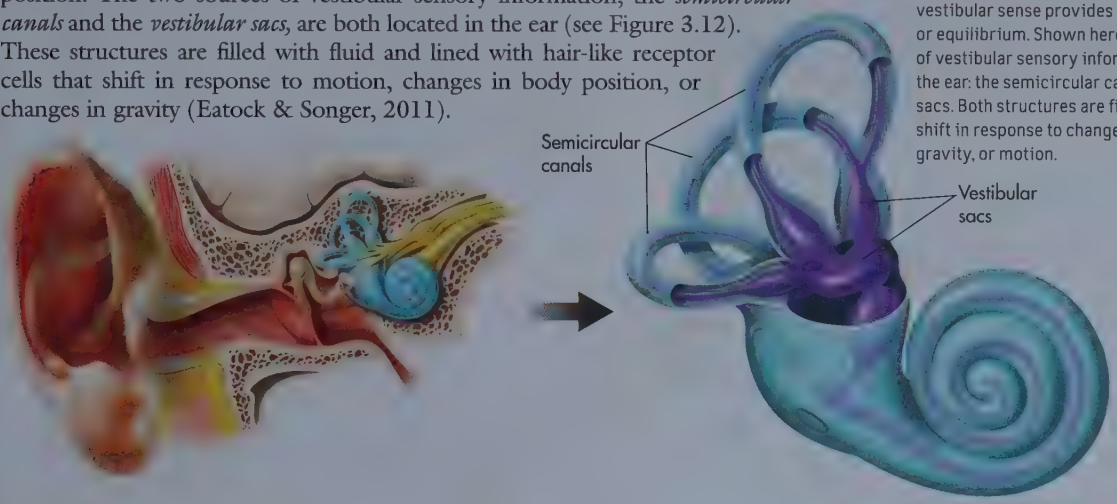


FIGURE 3.12 The Vestibular Sense The vestibular sense provides our sense of balance, or equilibrium. Shown here are the two sources of vestibular sensory information, both located in the ear: the semicircular canals and the vestibular sacs. Both structures are filled with fluids that shift in response to changes in body position, gravity, or motion.

When you experience environmental motion, like the rocking of a boat in choppy water, the fluids in the semicircular canals and the vestibular sacs are affected. Changes in your body's position, such as falling backward in a heroic attempt to return a volleyball serve, also affect the fluids. Your vestibular sense supplies the critical information that allows you to compensate for such changes and quickly reestablish your sense of balance.

Maintaining equilibrium also involves information from other senses, particularly vision. Under normal circumstances, this works to our advantage. However, when information from the eyes conflicts with information from the vestibular system, the result can be dizziness, disorientation, and nausea. These are the symptoms commonly experienced in motion sickness, the bane of many travelers in cars, on planes, on boats, and even in space. One strategy that can be used to combat motion sickness is to minimize sensory conflicts by focusing on a distant point or an object that is fixed, such as the horizon.

In the first part of this chapter, we've described how the body's senses respond to stimuli in the environment. Table 3.4 summarizes these different sensory systems. To make use of this raw sensory data, the brain must organize and interpret the data, and relate them to existing knowledge. Next, we'll look at the process of perception—how we make sense out of the information that we receive from our environment.

TABLE 3.4

Summary Table of the Senses

Sense	Stimulus	Sense Organ	Sensory Receptor Cells
Hearing (audition)	Sound waves	Ear	Hair cells in cochlea
Vision	Light waves	Eye	Rods and cones in retina
Color vision	Different wavelengths of light	Eye	Cones in retina
Smell (olfaction)	Airborne odor molecules	Nose	Hair-like receptor cells at top of nasal cavity
Taste (gustation)	Chemicals dissolved in saliva	Mouth	Taste buds
Touch	Pressure	Skin	Pacinian corpuscle
Pain	Tissue injury or damage; varied	Skin, muscles, and organs	Nociceptors
Movement (kinesthetic sense)	Movement of the body	None; muscle and joint tissue	Proprioceptors in muscle and joint tissue
Balance (vestibular sense)	Changes in position, gravity	Semicircular canals and vestibular sacs	Hair-like receptor cells in semicircular canals and vestibular sacs

CONCEPT REVIEW 3.2

The Nonvisual Senses

Fill in the blanks with the correct term.

1. The sensory receptors for hearing are embedded in the _____ membrane in the _____.
2. When activated, taste receptor cells send messages along neural pathways to the _____.
3. The bundled axons of the olfactory receptors project to a brain structure called the _____.
4. Hearing loss caused by damage to the bones of the middle ear is called _____.
5. The neurotransmitter called _____ plays an important role in the processing of pain signals.
6. Because of your _____ sense, you can touch your chin with your index finger even when your eyes are closed.

bottom-up processing Information processing that emphasizes the importance of the sensory receptors in detecting the basic features of a stimulus in the process of recognizing a whole pattern; analysis that moves from the parts to the whole; also called *data-driven processing.*

top-down processing Information processing that emphasizes the importance of the observer's knowledge, expectations, and other cognitive processes in arriving at meaningful perceptions; analysis that moves from the whole to the parts; also called *conceptually driven processing.*

Perception

KEY THEME

› Perception refers to the process of integrating, organizing, and interpreting sensory information into meaningful representations.

KEY QUESTIONS

› What are bottom-up and top-down processing, and how do they differ?
› What is Gestalt psychology?
› What Gestalt principles explain how we receive objects and their relationship to their surroundings?

Organizing Sensations into Meaningful Perceptions With virtually no conscious effort, the psychological process of perception allows you to integrate, organize, and interpret the lines, colors, and contours in this image as meaningful objects—a laughing child holding a panicky black cat in front of a Christmas tree. How did you reach those perceptual conclusions?



Courtesy of the authors

As we've seen, our senses are constantly registering a diverse range of stimuli from the environment and transmitting that information to the brain. But to make use of this raw sensory data, we must organize, interpret, and relate the data to existing knowledge.

Psychologists sometimes refer to this flow of sensory data from the sensory receptors to the brain as **bottom-up processing.** Also called *data-driven processing,* bottom-up processing is often at work when we're confronted with an ambiguous stimulus. For example, imagine trying to assemble a jigsaw puzzle one piece at a time, without knowing what the final picture will be. To accomplish this task, you would work with the individual puzzle pieces to build the image from the "bottom up," that is, from its constituent parts.

But as we interact with our environment, many of our perceptions are shaped by **top-down processing,** which is also referred to as *conceptually driven processing.* Top-down processing occurs when we draw on our knowledge, experiences, expectations, and other cognitive processes to arrive at meaningful perceptions, such as people or objects in a particular context.

Both top-down and bottom-up processing are involved in our everyday perceptions. For a simple illustration, look at the photograph (left), which sits on Don's desk. Top-down processing was involved as you reached a number of perceptual conclusions about the image. You quickly perceived a little girl holding a black cat—our daughter Laura when she was three, holding her cat, Nubbin. You also perceived a child as a whole object even though the cat is actually blocking a good portion of the view of Laura.

But now look at the background in the photograph, which is more ambiguous. Deciphering these images involves both bottom-up and top-down processing. Bottom-up processes help you determine that behind the little girl looms a large, irregularly shaped, dark green object with brightly colored splotches on it. But what is it?

CULTURE AND HUMAN BEHAVIOR

Ways of Seeing: Culture and Top-Down Processes

Do people in different cultures perceive the world differently? In Chapter 1, we described two types of cultures. Unlike people in *individualistic* cultures, who tend to emphasize independence, people in *collectivistic* cultures see humans as being enmeshed in complex relationships. This social perspective is especially pronounced in the East Asian cultures of Korea, Japan, and China, where a person's sense of self is highly dependent upon his or her social context (Beins, 2011). Consequently, East Asians pay much closer attention to the social context in which their own actions, and the actions of others, occur (Nisbett, 2007; Varnum & others, 2010).

The Cultural Eye of the Beholders

Do these cultural differences in social perspective influence visual perception and memory? Take a few seconds to look at the photo on the right. Was your attention drawn by the tiger? Or its surroundings?

In one study, Hannah Faye Chua and her colleagues (2005) used sophisticated eye-tracking equipment to monitor the eye movements of U.S. and Chinese students while they looked at similar photographs that showed a single focal object against a realistic, complex background. The results showed that their eye movements differed: The U.S. students looked sooner and longer at the focal object in the foreground than the Chinese students did. In contrast, the Chinese students spent more time looking at the background than the U.S. students did. And, the Chinese were also less likely to recognize the foreground objects when they were placed in front of a new background.

Rather than separating the object from its background, the Chinese students tended to see—and remember—object and background as a single perceptual image. Many psychologists believe that this pattern of results reflects the more "holistic" perceptual style that characterizes collectivistic cultures (Boduroglu & others, 2009; Boland & others, 2008).

Similarly, Joshua Goh and his colleagues (2009) compared the visual response of U.S. and East Asian participants to *changes* in photographs. They found that U.S. participants paid more attention to changes in the objects, but East Asian participants paid more attention to changes in the background. The U.S. participants also tended to focus their attention on the object alone, while the East Asian participants alternated looking at the object and the background, paying more attention to the *relationship* between the object and background. "Culture," the researchers observed, "may operate as a top-down mechanism that guides and interacts with basic neuro-perceptual processes."

Cultural Comfort Zones and Brain Functioning

Many psychologists now believe that these cultural differences in social and perceptual style also influence brain function (Park & Huang, 2010). For example, Psychologist Trey Hedden and his colleagues (2008) compared brain functioning in East Asian and U.S. participants while they made rapid perceptual judgments comparing two images of a square with an embedded line as shown in this image on the right.

The *relative* task involved determining if the lines in the two images were in the same proportion to the surrounding squares. The *absolute* task involved determining whether the two lines were the same absolute length, regardless of the size of the squares (see figure). Each participant made these judgments while their brain activity was tracked by an fMRI scanner.



James Warwick/Getty Images

Which do you notice—the tiger or its rocky surroundings?

Both groups were equally proficient at the task and used the same brain regions in making the simple perceptual judgments. However, the *pattern* of brain activation differed.

The individualistic U.S. participants showed greater brain activation while making relative judgments, meaning they had to exert more mental effort. The collectivistic East Asians showed the opposite pattern, devoting greater brain effort to making absolute judgments that required them to ignore the context. Essentially, all participants had to work harder at making perceptual judgments that were outside their cultural comfort zones.

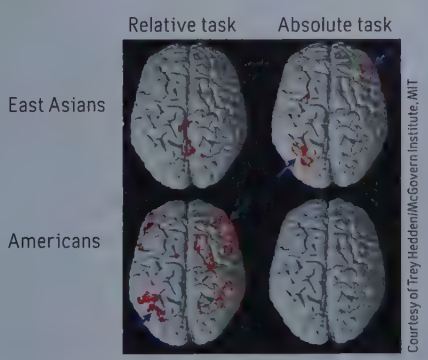
The bottom line? People from different cultures use the same neural processes to make perceptual judgments. But, their culture trains them to use them in different ways. As John Gabrieli (2008) points out, "The way in which the brain responds to these simple drawings reflects, in a predictable way, how the individual thinks about independent or interdependent social relationships." People from different cultures may not literally see the world differently—but they notice different things and think differently about what they *do* see.



Relative task: Is the proportion of the vertical line to the box the same in both images?



Absolute task: Is the absolute length of the two vertical lines the same?



Courtesy of Trey Hedden/McGovern Institute, MIT

CRITICAL THINKING

ESP: Can Perception Occur Without Sensation?

ESP, or **extrasensory perception**, means the detection of information by some means other than through the normal processes of sensation.

Do you believe in ESP? If you do, you're not alone (Ridolfo & others, 2010). Recent surveys conducted by the Associated Press and the Gallup Poll have found that close to 50 percent of American adults believe in ESP (Fram, 2007; Moore, 2005).

Forms of ESP include *telepathy*, which is the *direct* communication between the minds of two individuals; *clairvoyance*, the perception of a remote object or event, such as "sensing" that a friend has been injured in a car accident; *psychokinesis*—the ability to influence a physical object without touching it; and *precognition*—the ability to predict future events.

The general term for such unusual abilities is *paranormal phenomena*. *Paranormal* means "outside the range of normal experience." Thus, these phenomena cannot be explained by known laws of science and nature. **Parapsychology** refers to the scientific investigation of claims of various paranormal phenomena. Contrary to what many people think, very few psychologists conduct any kind of parapsychological research.

Have you ever felt as if you had just experienced ESP? Consider the following two examples:

- Your sister was supposed to stop by around 7:00. It's now 7:15, and you "sense" that something has happened to her. Shortly after 8:00 she calls, informing you that she's been involved in a fender bender. Did you experience clairvoyance?
- Some years ago, Sandy had a vivid dream that our cat Nubbin got lost. The next morning, Nubbin sneaked out the back door, went for an unauthorized stroll in the woods, and was gone for three days. Did Sandy have a precognitive dream?

Such common instances are sometimes used to "prove" that ESP exists. However, two less extraordinary concepts can explain both occurrences: coincidence and the fallacy of positive instances.

Coincidence describes an event that occurs simply by chance. For example, you have over a thousand dreams per year, most of which are about familiar people and situations. By mere chance, *some* aspect of *some* dream will occasionally correspond with reality.

The *fallacy of positive instances* is the tendency to remember coincidental events that seem to confirm our belief about unusual phenomena and to forget all the instances that do not. For example, think of the number of times you've thought something happened to someone but nothing did. Such situations are far more common than their opposites, but we quickly forget about the hunches that are not confirmed.

Why do people attribute chance events to ESP? Research has shown that believers in ESP are less likely to accurately estimate the probability of an event occurring by chance alone. Nonbelievers tend to be more realistic about the probability of events being the result of simple coincidence or chance (Dagnall & others, 2007; Rogers & others, 2009).

Parapsychologists attempt to study ESP in the laboratory under controlled conditions. Many initially convincing demonstrations of ESP are later shown to be the result of research design problems or of the researcher's unintentional cuing of the subject. Another problem involves *replication*. To be considered valid, experimental results must be able to be replicated, or repeated, by other scientists under identical laboratory conditions. Skeptics claim, and most psychologists agree, that to date, no parapsychology experiment claiming to show evidence of the existence of ESP has been successfully replicated (Hyman, 2010).

One active area of parapsychological research is the study of clairvoyance using an experimental procedure called the *ganzfeld procedure* (J. Palmer, 2003; Westerlund & others, 2006). (*Ganzfeld* is a German word that means "total field.") In a ganzfeld study, a "sender" in one room attempts to communicate the content of pictures or short video clips to a receiver in a separate room. Isolated from all contact and wearing goggles and headphones to block external sensory stimuli, the "receiver" attempts to detect the image that is being sent.

Summarizing dozens of ganzfeld studies conducted over 15 years, Lance Storm and his colleagues (2010; Di Risio, 2010) showed a "hit" rate

To identify the mysterious object, you must interpret the sensory data. Top-down processes help you identify the large green blotch as a Christmas tree—a conclusion that you probably would *not* reach if you had no familiarity with the way many Americans celebrate the Christmas holiday. The Christmas tree branches, ornaments, and lights are just fuzzy images, but other images work as clues—a happy child, a stuffed bear with a red-and-white stocking cap. Learning experiences create a conceptual knowledge base from which we can identify and interpret many objects, including kids, cats, and Christmas trees.

Clearly, bottom-up and top-down processing are both necessary to explain how we arrive at perceptual conclusions. But whether we are using bottom-up or top-down processing, a useful way to think about perception is to consider the basic perceptual questions we must answer in order to survive. We exist in an ever-changing environment that is filled with objects that may be standing still or moving, just like ourselves. Whether it's a bulldozer or a bowling ball, we need to be able to identify objects, locate objects in space, and, if they are moving, track their motion. Thus, our perceptual processes must help us organize our sensations to answer three basic, important questions: (1) What is it? (2) How far away is it? and (3) Where is it going?

In the next few sections, we will look at what psychologists have learned about the principles we use to answer these perceptual questions. Much of

ESP (extrasensory perception) Perception of information by some means other than through the normal processes of sensation.

parapsychology The scientific investigation of claims of paranormal phenomena and abilities.

Gestalt psychology (geh-SHTALT) A school of psychology founded in Germany in the early 1900s that maintained that our sensations are actively processed according to consistent perceptual rules that result in meaningful whole perceptions, or *gestalts*.



Dr. Elmar R. Gruber

The Ganzfeld Technique Clairvoyance and telepathy experiments often involve use of the *ganzfeld* technique. The research subject lies in a quiet room, with his eyes covered by ping-pong balls cut in half. White noise plays through the headphones covering his ears. Along with blocking extraneous sensory stimuli, this technique can induce mild hallucinations in some subjects (Wackerman & others, 2008).

that was well above chance, implying that some sort of transfer of information had taken place between sender and receiver. These results, published in a well-respected psychology journal, *Psychological Bulletin*, led some psychologists to speculate that there might be something to extrasensory perception after all—and that the ganzfeld procedure might be the way to detect it. But other psychologists, like Ray Hyman (2010), dispute the statistical techniques used and argue that these studies do *not* offer conclusive proof that ESP has been demonstrated.

The latest salvo in the ESP debate was fired by psychologist Daryl Bem (2011), who tested precognition in a series of nine experiments involving more than a thousand participants. Bem's ingenious strategy was to "time-reverse" standard psychological tasks, changing the normal order of cause-and-effect.

For example, practicing a list of words makes the words easier to remember. In one experiment, participants taking a memory test better remembered words that they practiced *after* taking the test. In another experiment, participants predicted the location of a target image on a computer screen *before* they saw it.

In all, eight of Bem's nine experiments showed small, but statistically significant effects in favor of precognition. These, and similar findings from Bem's series of experiments cannot be easily explained (Judd & Gawronski, 2011).

Bem's research sparked a flurry of media attention, including an appearance on *The Colbert Report*. It also triggered a firestorm of reaction from psychologists and other scientists (Alcock, 2011; Shermer, 2011). Much of the criticism focuses on the statistical methods used to analyze the data (Rouder & Morey, 2011; Wagenmakers & others, 2011). So far, Bem's work has not been replicated, but stay tuned.

Of course, the history of science is filled with examples of phenomena that were initially scoffed at and later found to be real. For example, the pain-relieving effects of acupuncture were initially dismissed by Western scientists as mere superstition or the power of suggestion. However, controlled studies have shown that acupuncture does effectively relieve pain and may be helpful in treating other conditions (National Center for Complementary and Alternative Medicine, 2011a).

So keep an open mind about ESP, but also maintain a healthy sense of scientific skepticism. It is entirely possible that some day convincing experimental evidence will demonstrate the existence of ESP abilities (see French & others, 2010; Schlitz & others, 2006). In the final analysis, all psychologists, including those who accept the possibility of ESP, recognize the need for evidence that meets the requirements of the scientific method.

CRITICAL THINKING QUESTIONS

- Why do you think that people who believe in ESP are less likely to attribute events to chance than people who don't think ESP is a real phenomenon?
- Can you think of any reasons why replication might be particularly elusive in research on extrasensory perception?
- Why is replication important in all psychological research, but particularly so in studies attempting to prove extraordinary claims, like the existence of ESP?

our discussion reflects the work of an early school of psychology called **Gestalt psychology,** which was founded by German psychologist **Max Wertheimer** in the early 1900s (Wertheimer, 1923). The Gestalt psychologists emphasized that we perceive whole objects or figures *(gestalts)* rather than isolated bits and pieces of sensory information. Roughly translated, the German word *Gestalt* means a unified whole, form, or shape. Although the Gestalt school of psychology no longer formally exists, the pioneering work of the Gestalt psychologists established many basic perceptual principles (S. Palmer, 2002).



Bettmann/Corbis

Max Wertheimer (1880–1943) Arguing that the whole is always greater than the sum of its parts, Wertheimer founded Gestalt psychology. Wertheimer and other Gestalt psychologists began by studying the principles of perception but later extended their approach to other areas of psychology.



Fabio Colombini/Animals Animals

Survival and Figure–Ground Relationships The natural camouflage that protects some animals, like this Brazilian moth, from predators illustrates the importance of figure–ground relationships in survival. When an animal's coloring and markings blend with its background, a predator cannot distinguish the animal (the *figure*) from its surroundings (the *ground*). In much the same way, military personnel and equipment are often concealed from enemy forces by clothing or tarps that are designed to blend in with the terrain, whether it be jungle, desert, forest, or snowy mountain range.

The Perception of Shape

What Is It?

When you look around your world, you don't see random edges, curves, colors, or splotches of light and dark. Rather, you see countless distinct objects against a variety of backgrounds. Although to some degree we rely on size, color, and texture to determine what an object might be, we rely primarily on an object's *shape* to identify it.

Figure–Ground Relationship

How do we organize our perceptions so that we see an object as separate from other objects? The early Gestalt psychologists identified an important perceptual principle called the **figure–ground relationship,** which describes how this works. When we view a scene, we automatically separate the elements of that scene into the *figure,* which is the main element of the scene, and the *ground,* which is its background.

You can experience the figure–ground relationship by looking at a coffee cup on a table. The coffee cup is the figure, and the table is the ground. Notice that usually the figure has a definite shape, tends to stand out clearly, and is perceptually meaningful in some way. In contrast, the ground tends to be less clearly defined, even fuzzy, and usually appears to be behind and farther away than the figure.

The early Gestalt psychologists noted that figure and ground have vastly different perceptual qualities (N. Rubin, 2001). As Gestalt psychologist Edgar Rubin (1921) observed, "In a certain sense, the ground has no shape." We notice the shape of the figure but *not* the shape of the background, even when that ground is used as a well-defined frame (see Figure 3.13). It turns out that brain neurons *also* respond differently to a stimulus that is perceived as a figure versus a stimulus that is part of the ground (Baylis & Driver, 2001). Particular neurons in the cortex that responded to a specific shape when it was the shape of the figure did *not* respond when the same shape was presented as part of the background.

The separation of a scene into figure and ground is not a property of the actual elements of the scene at which you're looking. Rather, your ability to separate a scene into figure and ground is a psychological accomplishment. To illustrate, look at the classic example shown in Figure 3.14. This perception of a single image in two different ways is called a *figure–ground reversal.*

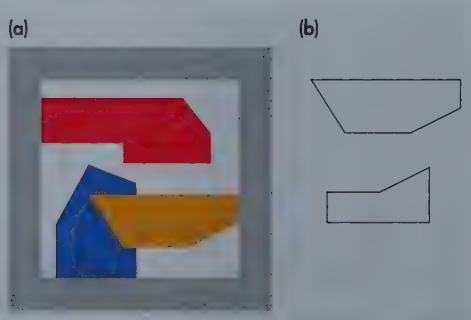


FIGURE 3.13 Figures Have Shape, but Ground Doesn't Which shape in **(b)** can also be found in **(a)?** The answer is that both shapes are in **(a).** It's easy to spot the top shape because it corresponds to one of the shapes perceived as a *figure* in **(a).** The bottom shape is harder to find because it is part of the *ground* or background of the total scene. Because we place more importance on figures, we're more likely to notice their shape while ignoring the shape of background regions.



FIGURE 3.14 A Classic Example of Figure–Ground Reversal Figure–ground reversals illustrate the psychological nature of our ability to perceptually sort a scene into the main element and the background. If you perceive the white area as the figure and the dark area as the ground, you'll perceive a vase. If you perceive the dark area as the figure, you'll perceive two faces.

Source: Rubin (2001).


PhotoDisc

(a) The Law of Similarity


Dan Chung/Reuters/Corbis

(b) The Law of Closure


Richard Broadwell/Alamy

(c) The Law of Good Continuation

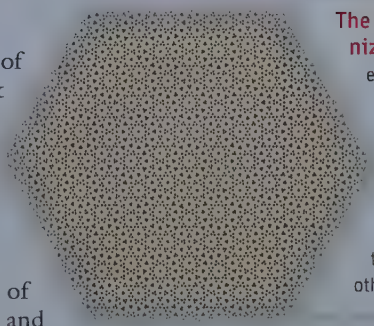

John Shaw/Photo Researchers

(d) The Law of Proximity

FIGURE 3.15 The Gestalt Principles of Organization
(a) *The law of similarity* is the tendency to perceive objects of a similar size, shape, or color as a unit or figure. Thus, you perceive four horizontal rows rather than six vertical columns of holiday cookies.
(b) The *law of closure* is the tendency to fill in the gaps in an incomplete image. Thus, you perceive the curved lines on the clock as smooth, continuous circles, even though they are interrupted by workers and the clock's hands.
(c) The *law of good continuation* is the tendency to group elements that appear to follow in the same direction as a single unit or figure. Thus, you tend to see the curved sections of the highways as continuous units.
(d) The *law of proximity* is the tendency to perceive objects that are close to one another as a single unit. Thus, you perceive these four penguins as two sets of penguin couples rather than as a single group of four penguins.

figure-ground relationship A Gestalt principle of perceptual organization that states that we automatically separate the elements of a perception into the feature that clearly stands out (the figure) and its less distinct background (the ground).

Perceptual Grouping



The Perceptual Urge to Organize As you scan this image, you'll experience firsthand the strong psychological tendency to organize visual elements to arrive at the perception of whole figures, forms, and shapes. Notice that as you shift your gaze across the pattern, you momentarily perceive circles, squares, and other geometric forms.

Many of the forms we perceive are composed of a number of different elements that seem to go together (Glicksohn & Cohen, 2011). It would be more accurate to say that we actively organize the elements to try to produce the stable perception of well-defined, whole objects. This is what perceptual psychologists refer to as "the urge to organize." What principles do we follow when we attempt to organize visual elements?

The Gestalt psychologists studied how the perception of visual elements becomes organized into patterns, shapes, and forms. They identified several laws, or principles, that we tend to follow in grouping elements together to arrive at the perception of forms, shapes, and figures. These principles include *similarity, closure, good continuation,* and *proximity.* Examples and descriptions of these perceptual laws are shown in Figure 3.15.

The Gestalt psychologists also formulated a general principle called the *law of Prägnanz,* or the *law of simplicity.* This law states that when several perceptual organizations of an assortment of visual elements are possible, the perceptual interpretation that occurs will be the one that produces the "best, simplest, and most stable shape" (Koffka, 1935). For an illustration, look at Figure 3.16. Do you perceive the image as two six-sided objects and one four-sided object? If you are following the law of Prägnanz, you don't. Instead, you perceptually organize the elements in the most cognitively efficient and simple way, perceiving them as three overlapping squares.

According to the Gestalt psychologists, the law of Prägnanz encompasses all the other Gestalt principles, including the figure–ground relationship. The implication of the law of Prägnanz is that our perceptual system works in an economical way to promote the interpretation of stable and consistent forms (Pinna & Reeves, 2009). The ability to efficiently organize elements into stable objects helps us perceive the world accurately. In effect, we actively and automatically construct a perception that reveals "the essence of something," which is roughly what the German word *Prägnanz* means.

FIGURE 3.16 What Do You See? The law of simplicity refers to our tendency to efficiently organize the visual elements of a scene in a way that produces the simplest and most stable forms or objects. You probably perceived this image as three overlapping squares rather than as two six-sided objects and one four-sided object.





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Depth Perception

How Far Away Is It?

KEY THEME

› Perception of distance and motion helps us gauge the position of stationary objects and predict the path of moving objects.

KEY QUESTIONS

› What are the monocular and binocular cues for distance or depth perception, and how does binocular disparity explain our ability to see three-dimensional forms in two-dimensional images?

› What visual cues help us perceive distance and motion?

› Why do we perceive the size and shape of objects as unchanging despite changes in sensory input?

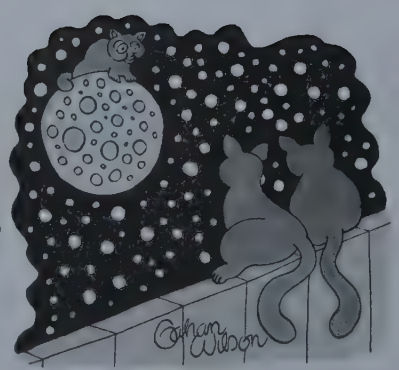
Being able to perceive the distance of an object has obvious survival value, especially regarding potential threats, such as snarling dogs or oncoming trains. But simply walking through your house or apartment also requires that you accurately judge the distance of furniture, walls, other people, and so forth. Otherwise, you'd be constantly bumping into doors, walls, and tables. The ability to perceive the distance of an object as well as the three-dimensional characteristics of an object is called **depth perception.**

Monocular Cues

We use a variety of cues to judge the distance of objects. **Monocular cues** require the use of only one eye (*mono* means "one"). When monocular cues are used by artists to create the perception of distance or depth in paintings or drawings, they are called *pictorial cues.* After familiarizing yourself with these cues, look at the photographs on the next page. Try to identify the monocular cues you used to determine the distance of the objects in each photograph.

1. *Relative size.* If two or more objects are assumed to be similar in size, the object that appears larger is perceived as being closer.
2. *Overlap.* When one object partially blocks or obscures the view of another object, the partially blocked object is perceived as being farther away. This cue is also called *interposition.*
3. *Aerial perspective.* Faraway objects often appear hazy or slightly blurred by the atmosphere.
4. *Texture gradient.* As a surface with a distinct texture extends into the distance, the details of the surface texture gradually become less clearly defined. The texture of the surface seems to undergo a gradient, or continuous pattern of change, from crisp and distinct when close to fuzzy and blended when farther away.
5. *Linear perspective.* Parallel lines seem to meet in the distance. For example, if you stand in the middle of a railroad track and look down the rails, you'll notice that the parallel rails seem to meet in the distance. The closer together the lines appear to be, the greater the perception of distance.
6. *Motion parallax.* When you are moving, you use the speed of passing objects to estimate the distance of the objects. Nearby objects seem to zip by faster than do distant objects. When you are riding on a commuter train, for example, houses and parked cars along the tracks seem to whiz by, while the distant downtown skyline seems to move very slowly.

Another monocular cue is *accommodation.* Unlike pictorial cues, accommodation utilizes information about changes in the shape of the lens of the eye to help us estimate distance. When you focus on a distant object, the lens is flat, but focusing on a nearby object causes the lens to thicken. Thus, to some degree, we use information provided by the muscles controlling the shape of the lens to judge depth. In general, however, we rely more on pictorial cues than on accommodation for depth perception.



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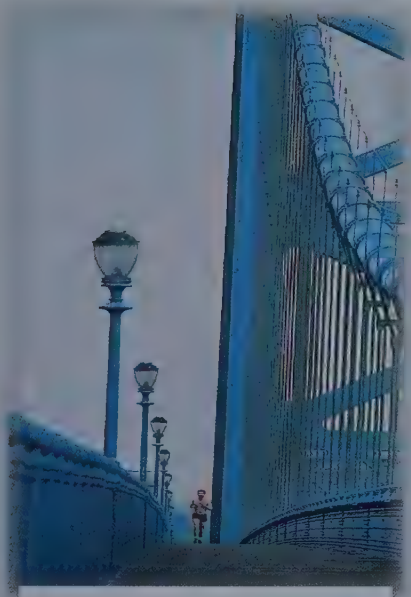
"It's nowhere near as far away as we thought!"

photomadnz/Alamy



Texture Gradient, Overlap, and Aerial Perspective Monocular cues are used to gauge distance of objects in a photograph. The rows of tulips appear crisp in the foreground but become increasingly fuzzy in the background, an example of texture gradient. Similarly, the rows of tulips at the top of the image are just blurs of color, creating an impression of even greater distance through aerial perspective. And, the yellow tulips are perceived as being closer than the gravel pathway and green stems that they overlap.

Superstock



Relative Size, Linear Perspective, and Aerial Perspective Several monocular depth cues are operating in this photograph. Relative size is particularly influential: The very small image of the jogger and the decreasing size of the street lamps contribute to the perception of distance. Linear perspective is evident in the apparent convergence of the walkway railings. Aerial perspective contributes to the perception of depth from the hazy background.

Steve McGurry/Magnum Photos



Motion Parallax This photograph of waiters in India passing a tray from one train car to the next captures the visual flavor of motion parallax. Objects that whiz by faster are perceptually judged as being closer, as in the case here of the blurred ground and bushes. Objects that pass by more slowly are judged as being farther away, as conveyed by the clearer details of buildings and more distant objects.

Binocular Cues

Binocular cues for distance or depth perception require information from both eyes. One binocular cue is *convergence*—the degree to which muscles rotate your eyes to focus on an object. The more the eyes converge, or rotate inward, to focus on an object, the greater the strength of the muscle signals and the closer the object is perceived to be. For example, if you hold a dime about six inches in front of your nose, you'll notice the slight strain on your eye muscles as your eyes converge to focus on the coin. If you hold the dime at arm's length, less convergence is needed. Perceptually, the information provided by these signals from your eye muscles is used to judge the distance of an object.

Another binocular distance cue is *binocular disparity*. Because our eyes are set a couple of inches apart, a slightly different image of an object is cast on the retina of each eye. When the two retinal images are very different, we interpret the object as being close by. When the two retinal images are more nearly identical, the object is perceived as being farther away (Parker, 2007).

Here's a simple example that illustrates how you use binocular disparity to perceive distance. Hold a pencil just in front of your nose. Close your left eye, then your right.

These images are quite different—that is, there is a great deal of binocular disparity between them. Thus you perceive the pencil as being very close. Now focus on another object across the room and look at it first with one eye closed, then the other. These images are much more similar. Because there is less binocular disparity between the two images, the object is perceived as being farther away. Finally, notice that with both eyes open, the two images are fused into one.

- **depth perception** The use of visual cues to perceive the distance or three-dimensional characteristics of objects.
- **monocular cues** (moe-NOCK-you-ler) Distance or depth cues that can be processed by either eye alone.
- **binocular cues** (by-NOCK-you-ler) Distance or depth cues that require the use of both eyes.



Hiroshi Kunoh. Originally published in *3-D Planet*. Cadence Books, San Francisco. Reprinted by permission.

Binocular Disparity and the Perception of Depth in Stereograms This stereogram, *Rustling Hares*, was created by artist Hiroshi Kunoh (Kunoh & Takaoki, 1994). To see the three-dimensional images, first hold the picture close to your face. Focus your eyes as though you are looking at an object that is beyond the book and farther away. Without changing your focus, slowly extend your arms and move the picture away from you. The image of the leaves will initially be blurry, then details will come into focus and you should see three rabbits. The three-dimensional images that can be perceived in stereograms occur because of binocular disparity—each eye is presented with slightly different visual information.

A *stereogram* is a picture that uses the principle of binocular disparity to create the perception of a three-dimensional image (Kunoh & Takaoki, 1994). Look at the stereogram shown above. When you first look at it, you perceive a two-dimensional picture of leaves. Although the pictorial cues of overlap and texture gradient provide some sense of depth to the image, the elements in the picture appear to be roughly the same distance from you.

However, a stereogram is actually composed of repeating columns of carefully arranged visual information. If you focus as if you are looking at some object that is farther away than the stereogram, the repeating columns of information will present a slightly different image to each eye. This disparate visual information then fuses into a single image, enabling you to perceive a three-dimensional image—three rabbits! To see the rabbits, follow the directions in the caption.

CONCEPT REVIEW 3.3

Depth Perception

Several monocular depth cues are evident in this photograph of a palace complex in Bangkok, Thailand. See if you can identify examples of the following depth cues:

1. Relative size
2. Overlap
3. Aerial perspective
4. Texture gradient
5. Linear perspective



© LOOK Die Bildagentur der Fotografen GmbH/Alamy

The Perception of Motion

Where Is It Going?

In addition to the ability to perceive the distance of stationary objects, we need the ability to gauge the path of moving objects, whether it's a baseball whizzing through the air, a falling tree branch, or an egg about to roll off the kitchen counter. How do we perceive movement?

As we follow a moving object with our gaze, the image of the object moves across the retina. Our eye muscles make microfine movements to keep the object in focus. We also compare the moving object to the background, which is usually stationary.

When the retinal image of an object enlarges, we perceive the object as moving toward us. Our perception of the speed of the object's approach is based on our estimate of the object's rate of enlargement (Harris & others, 2008). Neural pathways in the brain combine information about eye-muscle activity, the changing retinal image, and the contrast of the moving object with its stationary background. The end result? We perceive the object as moving.

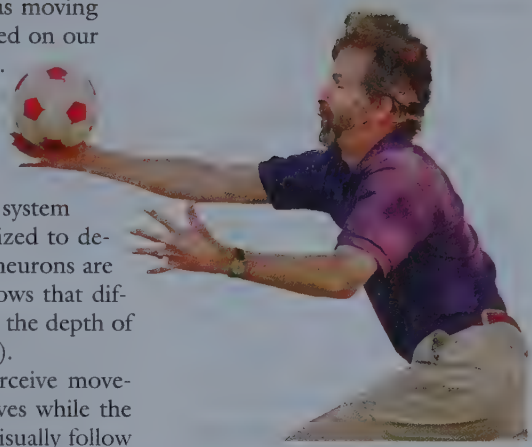
Neuroscientists do not completely understand how the brain's visual system processes movement. It's known that some neurons are highly specialized to detect motion in one direction but not in the opposite direction. Other neurons are specialized to detect motion at one particular speed. Research also shows that different neural pathways in the cerebral cortex process information about the depth of objects, movement, form, and color (Zeki, 2001; Regan & Gray, 2009).

Psychologically, we tend to make certain assumptions when we perceive movement. For example, we typically assume that the *object*, or figure, moves while the background, or frame, remains stationary (Rock, 1995). Thus, as you visually follow a bowling ball down the alley, you perceive the bowling ball as moving and not the alley, which serves as the background.

Because we have a strong tendency to assume that the background is stationary, we sometimes experience an illusion of motion called *induced motion*. Induced motion was first studied by Gestalt psychologist **Karl Duncker** in the 1920s (King & others, 2003). Duncker (1929) had subjects sit in a darkened room and look at a luminous dot that was surrounded by a larger luminous rectangular frame. When the *frame* slowly moved to the right, the subjects perceived the *dot* as moving to the left.

Why did subjects perceive the dot as moving? Part of the explanation has to do with top-down processing. Perceptually, Duncker's subjects *expected* to see the smaller dot move within the larger rectangular frame, not the other way around. If you've ever looked up at a full moon on a windy night when the clouds were moving quickly across its face, you've probably experienced the induced motion effect. The combination of these environmental elements makes the moon appear to be racing across the sky.

Another illusion of apparent motion is called *stroboscopic motion*. First studied by Gestalt psychologist Max Wertheimer in the early 1900s, stroboscopic motion creates an illusion of movement with two carefully timed flashing lights (Wertheimer, 1912). A light briefly flashes at one location, followed about a tenth of a second later by another light briefly flashing at a second location. If the time interval and distance between the two flashing lights are just right, a very compelling illusion of movement is created.



Florence Low

Mike and Motion Perception Catching a ball involves calculating an array of rapidly changing bits of visual information, including the ball's location, speed, and trajectory. Mike was especially appreciative of his newly regained motion perception. As Mike wrote in his journal, "Top on my list is being able to catch a ball in the air. This is pretty hard to do if you are totally blind, and now I can play ball with my boys and catch the ball 80 percent of the time it is thrown to me. I have spent half my life chasing a ball around in one way or another, so this is a big deal."



GustoImages/Photo Researchers

Stroboscopic Motion and Movies The perception of smooth movements in a movie is due to stroboscopic motion. Much like this series of still photographs of an athlete performing a long jump, a motion picture is actually a series of static photographs that are projected onto the screen at the rate of 24 frames per second, producing the illusion of smooth motion.

perceptual constancy The tendency to perceive objects, especially familiar objects, as constant and unchanging despite changes in sensory input.

size constancy The perception of an object as maintaining the same size despite changing images on the retina.

shape constancy The perception of a familiar object as maintaining the same shape regardless of the image produced on the retina.

perceptual illusion The misperception of the true characteristics of an object or an image.

Müller-Lyer illusion A famous visual illusion involving the misperception of the identical length of two lines, one with arrows pointed inward, one with arrows pointed outward.

What causes the perception of stroboscopic motion? Although different theories have been proposed, researchers aren't completely sure. The perception of motion typically involves the movement of an image across the retina. However, during stroboscopic motion the image does *not* move across the surface of the retina. Rather, the two different flashing lights are detected at two different points on the surface of the retina. Somehow the brain's visual system combines this rapid sequence of visual information to arrive at the perceptual conclusion of motion, even though no movement has occurred. The perception of smooth motion in a movie is also due to stroboscopic motion.

Perceptual Constancies

Consider this scenario. As you're driving on a flat stretch of highway, a red SUV zips past you and speeds far ahead. As the distance between you and the SUV grows, its image becomes progressively smaller until it is no more than a dot on the horizon. Yet, even though the image of the SUV on your retinas has become progressively smaller, you don't perceive the vehicle as shrinking. Instead, you perceive its shape, size, and brightness as unchanged.

This tendency to perceive objects, especially familiar objects, as constant and unchanging despite changes in sensory input is called **perceptual constancy.** Without this perceptual ability, our perception of reality would be in a continual state of flux. If we simply responded to retinal images, our perceptions of objects would change as lighting, viewing angle, and distance from the object changed from one moment to the next. Instead, the various forms of perceptual constancy promote a stable view of the world.

Size and Shape Constancy

Size constancy is the perception that an object remains the same size despite its changing image on the retina. When our distance from an object changes, the image of the object that is cast on the retinas of our eyes also changes, yet we still perceive it to be the same size. The example of the red SUV illustrates the perception of size constancy. As the distance between you and the red SUV increased, you could eventually block out the retinal image of the vehicle with your hand, but you don't believe that your hand has suddenly become larger than the SUV. Instead, your brain automatically adjusts your perception of the vehicle's size by combining information about retinal image size and distance.

An important aspect of size constancy is that if the retinal image of an object does *not* change but the perception of its distance *increases,* the object is perceived as larger. To illustrate, try this: Stare at a 75-watt lightbulb for about 10 seconds. Then focus on a bright, distant wall. You should see an afterimage of the lightbulb on the wall that will look several times larger than the original lightbulb. Why? When you looked at the wall, the lingering afterimage of the lightbulb on your retina remained constant, but your perception of distance increased. When your brain combined and interpreted this information, your perception of the lightbulb's size increased. Remember this demonstration. We'll mention it again when we explain how some perceptual illusions occur.

Shape constancy is the tendency to perceive familiar objects as having a fixed shape regardless of the image they cast on our retinas. Try looking at a familiar object, such as a door, from different angles, as in the photograph above. Your perception of the door's rectangular shape remains constant despite changes in its retinal image. Shape constancy has a greater influence on your perceptions than you probably realize (see Figure 3.17).



Joel Meyerowitz

The Doors of Perception Each door in the photograph is positioned at a different angle and thus produces a differently shaped image on your retinas. Nevertheless, because of the perceptual principle of shape constancy, you easily identify all five shapes as rectangular doors.

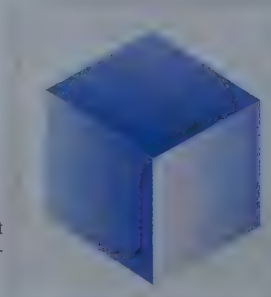


FIGURE 3.17 How Many Right Angles Do You See? Most people find 12 right angles in this drawing of a slightly tilted cube. But look again. There are *no* right angles in the drawing. Shape constancy leads you to perceive an image of a cube with right angles, despite the lack of sensory data to support that perception.

Perceptual Illusions

KEY THEME

› Perceptual illusions underscore the idea that we actively construct our perceptual representations of the world according to psychological principles.

KEY QUESTIONS

› How can the Müller-Lyer and moon illusions be explained?

› What do perceptual illusions reveal about perceptual processes?

› What roles do perceptual sets, learning experiences, and culture play in perception?

Our perceptual processes are largely automatic and unconscious. On the one hand, this arrangement is mentally efficient. With a minimum of cognitive effort, we decipher our surroundings, answering important perceptual questions and making sense of the environment. On the other hand, because perceptual processing is largely automatic, we can inadvertently arrive at the wrong perceptual conclusion. When we misperceive the true characteristics of an object or an image, we experience a **perceptual illusion.**

During the past century, well over 200 perceptual illusions have been discovered. One famous perceptual illusion is shown in Figure 3.18. The perceptual contradictions of illusions are not only fascinating but can also shed light on how the normal processes of perception guide us to perceptual conclusions. Given the basics of perception that we've covered thus far, you're in a good position to understand how and why some famous illusions seem to occur.

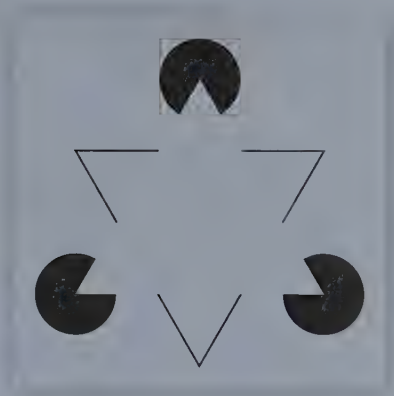
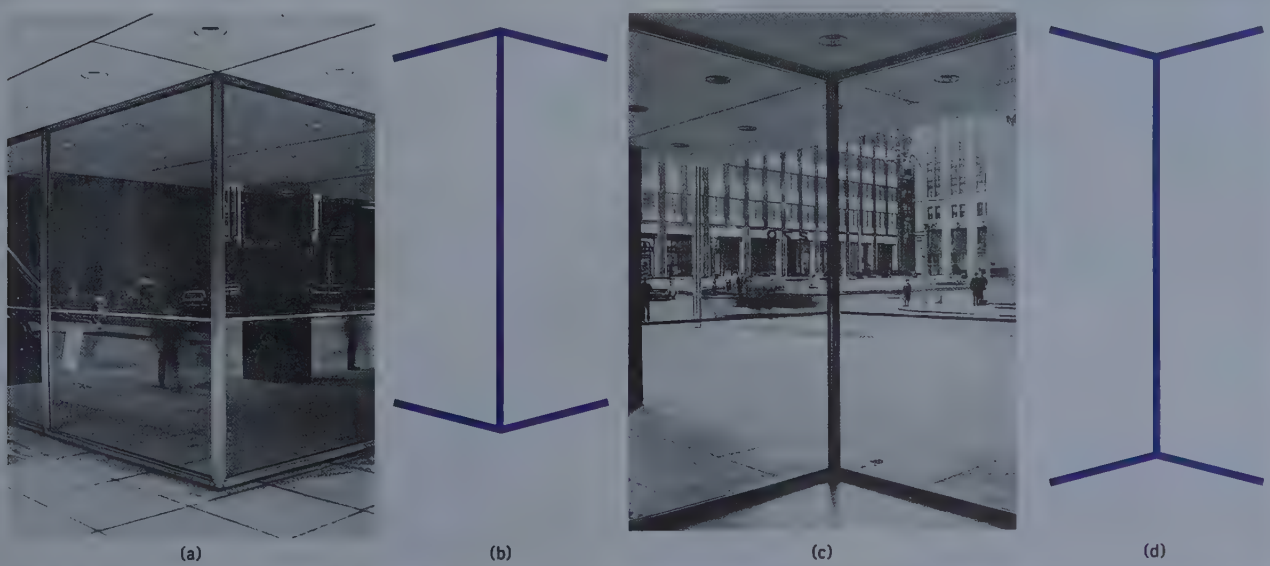


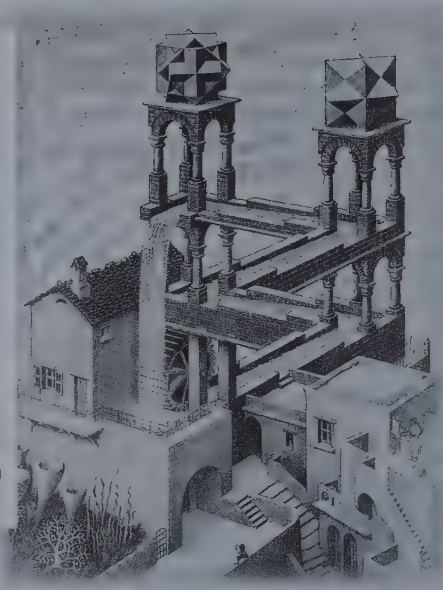
FIGURE 3.18 Illusory Contours: How Many Triangles Do You See? The Gestalt principles of perceptual organization contribute to the illusion of triangular contours in this image. The second you look at this ambiguous image, you instantly reverse figure and ground so that the black circular regions become the ground, while the white region is visually favored as the figure. In organizing these visual fragments, which are lined up very precisely, the Gestalt principles of closure and good continuation contribute to the perceptual construction of a solid white triangle covering three black disks and an inverted triangle. The images produce a second intriguing illusion: The pure white illusory triangle seems brighter than the surrounding white paper.

The Müller-Lyer Illusion

Look at the center line made by the corners of the glass walls in photographs (a) and (c) in Figure 3.19. Which line is longer? If you said photograph (c), then you've just experienced the **Müller-Lyer illusion.** In fact, the two center lines are the same length, even though they *appear* to have different lengths. You can confirm that they are the same length by measuring them. The same illusion occurs when you look at a simple line drawing of the Müller-Lyer illusion, shown in parts (b) and (d) of Figure 3.19.

FIGURE 3.19 The Müller-Lyer Illusion Compare the two photographs. Which *corner* line is longer? Now compare the two line drawings. Which *center* line is longer? In reality, the center lines in the photographs and the line drawings are all exactly the same length, which you can prove to yourself with a ruler.





From Mind Sights by Shepard. ©1990 by Roger N. Shepard. Used with permission of W.H. Freeman and Company.

An Impossible Figure: Escher's *Waterfall* (1961) Impossible figures are not illusions, but visual riddles that capitalize on our tendency to organize visual elements into a meaningful scene (Ramachandran & Rogers-Ramachandran, 2007). In most paintings, artists use depth and distance cues to create realistic scenes. But Dutch artist M.C. Escher (1898–1972) used perceptual principles to create complex visual puzzles. In Escher's work, conflicting depth cues produce a perceptual paradox. As you try to integrate the conflicting perceptual cues into an integrated whole, you confront perceptual contradictions—such as the conclusion that water is running uphill. Escher was fascinated by the "psychological tension" created by such images (Schattschneider & others, 2005).

The Müller-Lyer illusion is caused in part by visual depth cues that promote the perception that the center line in photograph (c) is *farther* from you (Gregory, 1968; Rock, 1995). When you look at photograph (c), the center line is that of a wall jutting away from you. When you look at drawing (d), the outward-pointing arrows create much the same visual effect—a corner jutting away from you. In Figure 3.19 (a) and (b), visual depth cues promote the perception of *lesser* distance—a corner that is jutting toward you.

Size constancy also seems to play an important role in the Müller-Lyer illusion. Because they are the same length, the two center lines in the photographs and the line drawings produce retinal images that are the same size. However, as we noted in our earlier discussion of size constancy, if the retinal size of an object stays the same but the perception of its distance increases, we will perceive the object as being larger. Previously, we demonstrated this with the afterimage of a lightbulb that seemed much larger when viewed against a distant wall.

The same basic principle seems to apply to the Müller-Lyer illusion. Although all four center lines produce retinal images that are the same size, the center lines in images (c) and (d) are embedded in visual depth cues that make you perceive them as farther away. Hence, you perceive the center lines in these images as being longer, just as you perceived the afterimage of the lightbulb as being larger when viewed on a distant wall.

Keep in mind that the arrows pointing inward or outward are responsible for creating the illusion in the Müller-Lyer illusion. Take away those potent depth cues and the Müller-Lyer illusion evaporates. You perceive the two lines just as they are—the same length.



Sol Mednick

The Moon Illusion Dispelled The *moon illusion* is subjectively very compelling. When viewed on the horizon, the moon appears to be much larger than when it is viewed higher in the sky. But as this time-lapse sequence of the moon rising over the Seattle skyline shows, the size of the moon remains the same as it ascends in the sky.

The Moon Illusion

Another famous illusion is one you've probably experienced firsthand—the **moon illusion.** When a full moon is rising on a clear, dark night, it appears much larger when viewed on the horizon against buildings and trees than it does when viewed in the clear sky overhead. But the moon, of course, doesn't shrink as it rises. In fact, *the retinal size of the full moon is the same in all positions.* Still, if you've ever watched the moon rise from the horizon to the night sky, it does *appear* to shrink in size. What causes this illusion?

Part of the explanation has to do with our perception of the distance of objects at different locations in the sky (Ozkan & Braunstein, 2010). Researchers have found that people perceive objects on the horizon as farther away than objects that are directly overhead in the sky. The horizon contains many familiar distance cues, such as buildings, trees, and the smoothing of the texture of the landscape as it fades into the distance. The moon on the horizon is perceived as being *behind* these depth cues, so the depth perception cue of overlap adds to the perception that the moon on the horizon is farther away.

The moon illusion also involves the misapplication of the principle of size constancy. Like the afterimage of the glowing lightbulb, which looked larger on a distant wall, the moon looks larger when the perception of its distance increases. Remember, the retinal image of the moon is the *same* in all locations, as was the afterimage of the lightbulb. Thus, even though the retinal image of the moon remains constant, we perceive the moon as being larger because it seems farther away on the horizon (Kaufman & others, 2007).

If you look at a full moon on the horizon through a cardboard tube, you'll remove the distance cues provided by the horizon. The moon on the horizon shrinks immediately—and looks the same size as it does when directly overhead.

Mike and Perceptual Illusions

Perceptual illusions underscore the fact that what we see is *not* merely a simple reflection of the world, but our subjective perceptual interpretation of it. We've been developing and refining our perceptual interpretations from infancy onward. But what about Mike, who regained low vision after more than four decades of blindness?

Psychologist Ione Fine and her colleagues (2003) assessed Mike's perceptual processing with a couple of perceptual illusions. For example, Mike was presented with an image containing illusory contours, shown on the right. It's much like the more complex image we discussed in Figure 3.18. When asked, "What is the 'hidden' shape outlined by the black apertures?" Mike had no response. However, when the form was outlined in red, Mike immediately perceived the red square.

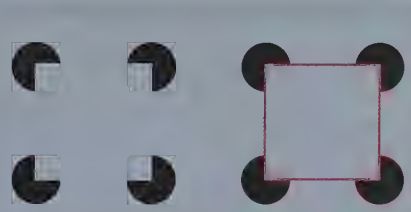
Now look at Figure 3.20. Which tabletop is longer? If you used your keen perceptual skills and confidently said (a), you'd be wrong. If you responded as Mike did and said that the two tabletops are of identical size and shape, you'd be correct. You can use a ruler or tracing paper to verify this. This illusion is referred to as the *Shepard Tables,* named after its creator, psychologist Roger Shepard (1990).

Why wasn't Mike susceptible to this compelling visual illusion? Partly, it's because he does not automatically use many of the depth perception cues we discussed earlier (Gregory, 2003). As psychologist Donald MacLeod explained, "Mike is impressively free from some illusions that beset normal vision, illusions that reflect the constructive processes involved in the perception of three-dimensional objects" (Abrams, 2002).

Although seeing is said to be believing, in the case of illusions, believing can lead to seeing something that isn't really there. As Mike gets more perceptual practice with the world, it will be interesting to see if he learns to fall for the same illusions that most of us do.

Like any psychological process, perception can be influenced by many factors, including our expectations. In the final section of this chapter, we'll consider how prior experiences and cultural factors can influence our perceptions of reality.

What Is the Hidden Shape?



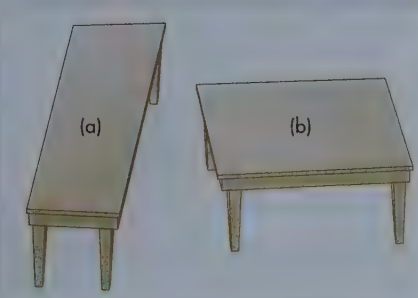


FIGURE 3.20 Which Tabletop Is Longer?
The *Shepard Tables* illusion consists of two tables that are oriented in different directions. It capitalizes on our automatic use of depth perception cues to perceive what is really a two-dimensional drawing as three-dimensional objects. By relying on these well-learned depth perception cues, most people pick (a) as being the longer tabletop. In contrast, Mike May was oblivious to the perceptual illusion. He correctly responded that the two tabletops were the same size and shape (Fine & others, 2003). You can verify this with a ruler.

Source: Illusion adapted from Shepard (1990).

The Effects of Experience on Perceptual Interpretations

Our educational, cultural, and life experiences shape what we perceive. As a simple example, consider airplane cockpits. If your knowledge of the instruments contained in an airplane cockpit is limited, as is the case with your author Sandy, an airplane cockpit looks like a meaningless jumble of dials. But your author Don, who is a pilot, has a very different perception of an airplane cockpit. Rather than a blur of dials, he sees altimeters, VORs, airspeed and RPM indicators, and other instruments, each with a specific function. Our different perceptions of an airplane cockpit are shaped by our prior learning experiences.

moon illusion A visual illusion involving the misperception that the moon is larger when it is on the horizon than when it is directly overhead.

CULTURE AND HUMAN BEHAVIOR

Culture and the Müller-Lyer Illusion: The Carpentered-World Hypothesis

Since the early 1900s, it has been known that people in industrialized societies are far more susceptible to the Müller-Lyer illusion than are people in some nonindustrialized societies (Matsumoto & Juang, 2008; Phillips, 2011). How can this difference be explained?

Cross-cultural psychologist Marshall Segall and his colleagues (1963, 1966) proposed the *carpentered-world hypothesis*. They suggested that people living in urban, industrialized environments have a great deal of perceptual experience in judging lines, corners, edges, and other rectangular, manufactured objects. Thus, people in carpentered cultures would be more susceptible to the Müller-Lyer illusion, which involves arrows mimicking a corner that is jutting toward or away from the perceiver.

In contrast, people who live in noncarpentered cultures more frequently encounter natural objects. In these cultures, perceptual experiences with straight lines and right angles are relatively rare. Segall predicted that people from these cultures would be less susceptible to the Müller-Lyer illusion.

To test this idea, Segall and his colleagues (1963, 1966) compared the responses of people living in carpentered societies, such as Evanston, Illinois, with those of people living in noncarpentered societies, such as remote areas of Africa. The results confirmed their hypothesis. The Müller-Lyer illusion was stronger for those living in carpentered societies. Could the difference in illusion susceptibility be due to some sort of biological difference rather than a cultural difference? To address this issue, psychologist V. Mary Stewart (1973) compared groups of white and African American schoolchildren living in Evanston, Illinois. Regardless of race, all of the children living in the city were equally susceptible to the Müller-Lyer illusion. Stewart also compared groups of black African children in five different areas of Zambia—ranging from the very carpentered capital city of Lusaka to rural, noncarpentered areas of the country. Once again, the African children living in the carpentered society of Lusaka were just as susceptible to the illusion as the Evanston children, but the African children living in the noncarpentered countryside were not.



Robert Estall Photo Agency/Alamy

A Noncarpentered Environment People who live in urban, industrialized environments have a great deal of perceptual experience with straight lines, edges, and right angles. In contrast, people who live in a noncarpentered environment, like the village shown here, have little experience with right angles and perfectly straight lines (Phillips, 2011). Are people who grow up in a noncarpentered environment equally susceptible to the Müller-Lyer illusion?

These findings provided some of the first evidence for the idea that culture could shape perception. As Segall (1994) later concluded, "Every perception is the result of an interaction between a stimulus and a perceiver shaped by prior experience." Thus, people who grow up in very different cultures might well perceive aspects of their physical environment differently.

Learning experiences can vary not just from person to person but also from culture to culture. The Culture and Human Behavior box, "Culture and the Müller-Lyer Illusion," discusses the important role that unique cultural experiences can play in perception.

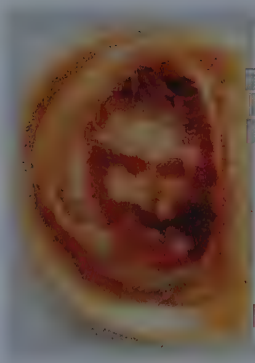
Perception can also be influenced by an individual's expectations, motives, and interests. The term **perceptual set** refers to the tendency to perceive objects or situations from a particular frame of reference. Perceptual sets usually lead us to reasonably accurate conclusions. If they didn't, we would develop new perceptual sets that were more accurate. But sometimes a perceptual set can lead us astray. For example, someone with an avid interest in UFOs might readily interpret unusual cloud formations as a fleet of alien spacecraft. Sightings of Bigfoot, mermaids, and the Loch Ness monster that turn out to be brown bears, manatees, or floating logs are all examples of perceptual set.

People are especially prone to seeing *faces* in ambiguous stimuli, as in the photos shown on the next page. Why? One reason is that the brain is wired to be uniquely responsive to faces or face-like stimuli (Leopold & Rhodes, 2010; Pascalis & Kelly, 2009). Research by Doris Tsao (2006a, 2006b) showed that the primate brain contains individual brain neurons that respond exclusively to faces or face-like images. This specialized face recognition system allows us to identify an individual face out of the thousands that we can recognize (Kanwisher & Yovel, 2009).

■ **perceptual set** The tendency to perceive objects or situations from a particular frame of reference.



Courtesy of Goldenpalace.com



The $28,000 Grilled Cheese Sandwich: What Do You See? Is that Marlene Dietrich on that grilled cheese sandwich? Ten years after she first noticed what she thought was the face of the Virgin Mary on her grilled cheese sandwich (left), Diana Duyser auctioned it off on eBay. The winning bid? Duyser got $28,000 for her carefully preserved (and partially eaten) relic. Donna Lee, however, only made a paltry $1,775 for her pirogi, a type of Polish dumpling, which she believes bears the face of Jesus. (We think it looks like Al Pacino . . . or Abraham Lincoln.) Why are we so quick to perceive human faces in ambiguous stimuli?

But this extraordinary neural sensitivity also makes us more liable to false positives, seeing faces that aren't there. Vague or ambiguous images with face-like blotches and shadows can also trigger the brain's face recognition system. Thus, we see faces where they don't exist at all—except in our own minds.

CONCEPT REVIEW 3.4

Perceptual Principles

Fill in the blanks using the correct term.

1. When Jenny was flying to the South Pacific, she saw several lush green islands that stood out in a sea of bright blue. In this example, the islands are the _____ and the sea is the _____.

2. As the football is hurtling toward you, it creates a progressively larger image on your retina, and the angle of the ball is constantly changing. Despite these drastic changes in sensory output, the phenomena of _____ and _____ enable you to continue to perceive the object as a football.

3. •••• •••• •••• If you followed the law of _____, you perceived this arrangement as three groups of four dots.

4. ✱✱✱✱●●●●✱✱✱✱●●●● If you followed the law of _____ you perceived this arrangement as two groups of green dots and two groups of black dots.

5. Hundreds of people flocked to an Indiana town when it was reported that the face of a religious figure had appeared in a rust stain on the side of a water tower. This perception was probably an example of _____.

CLOSING THOUGHTS

From reflections of light waves to perceptual illusions, the world you perceive is the result of a complex interaction among distinctly dissimilar elements—environmental stimuli, sensory receptor cells, neural pathways, and brain mechanisms. Equally important are the psychological and cultural factors that help shape your perception of the world. As Mike's story illustrated, the world we experience relies not only on the functioning of our different sensory systems but also on neural pathways sculpted by years of learning experiences from infancy onward.

Although he spent more than four decades totally blind, Mike never seemed to lack vision. With conviction, humor, and curiosity, he sought out a life of change and adventure. And he found it. Rather than expecting his surgery to fundamentally change his life, he simply welcomed the opportunity for new experiences. Throughout his life, Mike wrote, "I have sought change and thrive on it. I expected new and interesting experiences from getting vision



Alyson Aliano

"I am Mike May. . . ." "By getting some sight, I gained some new elements of my personality and lifestyle without rejecting the blindness. I am not a blind person or a sighted person. I am not even simply a visually impaired person. I am Mike May with his quirky sense of humor, graying hair, passion for life, and rather unusual combination of sensory skills."

biofeedback Technique that involves using auditory or visual feedback to learn to exert voluntary control over involuntary body functions, such as heart rate, blood pressure, blood flow, and muscle tension.

acupuncture Ancient Chinese medical procedure involving the insertion and manipulation of fine needles into specific locations on the body to alleviate pain and treat illness; modern acupuncture sometimes involves sending electrical current through the needles rather than manipulating them.

as an adult but not that it would change my life" (May, 2004). As Mike points out, "My life was incredibly good before I had my operation. I've been very fortunate and had incredible opportunities, and so I can say that life was incredible. It was fantastic as a non-seeing person, and life is still amazing now that I have vision. That's been consistent between not seeing and seeing. Experiencing life to its fullest doesn't depend on having sight" (May, 2002b).

We hope that learning about Mike's experiences has provided you with some insights as to how your own life experiences have helped shape your perceptions of the world. In the next section, we'll provide you with some tips that we think you'll find useful in influencing your perceptions of painful stimuli.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Strategies to Control Pain

Pain specialists use a variety of techniques to control pain, including *hypnosis* and *painkilling drugs*. We'll discuss both of these topics in the next chapter. Two other pain-relieving strategies are **biofeedback** and **acupuncture**.

Biofeedback is a process of learning voluntary control over largely automatic body functions, such as heart rate, blood pressure, blood flow, and muscle tension. Using sensitive equipment that signals subtle changes in a specific bodily function, people can learn to become more aware of their body's internal state. With the auditory or visual feedback provided by the biofeedback instrument, the person learns how to exercise conscious control over a particular bodily process.

For example, an individual who experiences chronic tension headaches might use biofeedback to learn to relax shoulder, neck, and facial muscles. Numerous studies have shown that biofeedback is effective in helping people who experience tension headaches, migraine headaches, jaw pain, and back pain (deCharms & others, 2005; Nestoriuc & Martin, 2007).

Acupuncture is a pain-relieving technique that has been used in traditional Chinese medicine for thousands of years. In the United States, acupuncture has been practiced for about 200 years. Currently, about 3 million Americans each year seek acupuncture treatment for various types of pain (National Center for Complementary and Alternative Medicine, 2011c).

Acupuncture involves inserting tiny, sterile needles at specific points in the body. The needles are then twirled, heated, or stimulated with a mild electrical current. Exactly how this stimulation diminishes pain signals or the perception of pain has yet to be completely explained (Moffet, 2008, 2009). Some research has shown that acupuncture stimulates the release of endorphins in the brain and may also inhibit the production of substance P (Field, 2009; Lee & others, 2009). However, evidence suggests that psychological factors also play a significant role in the pain-relieving effects of acupuncture. Reviews of clinical studies involving patients who received true acupuncture, placebo acupuncture, or no acupuncture found that true acupuncture was only slightly more effective than placebo acupuncture in diminishing pain (Madsen & others, 2009; Moffet, 2009).

Relief from back pain is the most commonly reported reason for seeking acupuncture treatment, followed by joint pain, neck pain, and headache (National Center for Complementary and Alternative Medicine, 2011b). Acupuncture is also being scientifically evaluated as a treatment for other conditions, including menstrual pain, osteoarthritis of the knee, nausea associated with cancer chemotherapy, and infertility (Domar & others, 2009; Huang & others, 2009; National Cancer Institute, 2008; Lee & Fan, 2009).



Michael Nagle/The New York Times/Redux

Acupuncture in the NFL Lisa Ripi works on New York Jets player Tony Richardson, one of 40 NFL players that she regularly treats with a combination of acupuncture and massage for pain, muscle stiffness, and injuries.

But what about everyday pain, such as the pain that accompanies a sprained ankle or a trip to the dentist? There are several simple techniques that you can use to help cope with minor pain.

Self-Administered Strategies

1. Distraction

By actively focusing your attention on some nonpainful task, you can often reduce pain (Edwards & others, 2009). For example, you can mentally count backward by sevens from 901, multiply pairs of two-digit numbers, draw different geometric figures in your mind, or count ceiling tiles. You can also focus on the details of a picture or other object.

Or, try our favorite technique, which we'll dub the "iPod pain relief strategy." Intently listening to music, especially calming music, can reduce discomfort (Loewy & Spintge, 2011; North & Hargreaves, 2009).

2. Imagery

Creating a vivid mental image can help control pain (Pincus & Sheikh, 2009). Usually people create a pleasant and progressive scenario, such

as walking along the beach or hiking in the mountains. Try to imagine all the different sensations involved, including the sights, sounds, aromas, touches, and tastes. The goal is to become so absorbed in your fantasy that you distract yourself from sensations of pain.

3. Relaxation and meditation

Deep relaxation can be a very effective strategy for deterring pain sensations (Edwards & others, 2009; Turk & Winter, 2006). One simple relaxation strategy is deep breathing: Inhale deeply, then exhale very slowly and completely, releasing tension throughout your body. As you exhale, consciously note the feelings of relaxation and warmth you've produced in your body.

Several studies have shown that practicing meditation is an effective way to minimize pain (see Brown & Jones, 2010; Grant & others, 2011). Meditation may reduce the subjective experience of pain through multiple pathways, including relaxation, distraction, and inducing a sense of detachment from the painful experience. Apparently, you do not need to be an expert or longer-term meditator to benefit from meditation's pain-relieving effects. Fadel Zeidan and his colleagues (2011) found that after just four 20-minute training sessions in simple meditation technique, participants' ratings of the unpleasantness of a painful stimulus dropped by 57% and ratings of its intensity dropped by 40%. (We'll discuss meditation in more detail in the next chapter.)

4. Counterirritation

The technique of counter-irritation has been used for centuries. Counterirritation effectively decreases pain by creating a strong, competing sensation that's mildly stimulating or irritating (Piche & others, 2009). People often do this naturally, as when they vigorously rub an injury or bite their lip during an injection.

How does rubbing the area where an injury has occurred reduce pain? The intense sensations of pain and the normal sensations of touch are processed through different nerve fibers going to the spinal cord. Increasing normal sensations of touch interferes with the transmission of high-intensity pain signals.

While undergoing a painful procedure, you can create and control a competing discomfort by pressing your thumbnail into your index finger. Focusing your attention on the competing discomfort may lessen your overall experience of pain.

5. Positive self-talk and reappraisal

This strategy involves making positive coping statements, either silently or out loud, during a painful episode or procedure. Examples of positive self-talk include statements such as, "It hurts, but I'm okay, I'm in control" and "I'm uncomfortable, but I can handle it."

Self-talk can also include reappraising or redefining the pain (Edwards & others, 2009). Substituting realistic and constructive thoughts about the pain experience for threatening or helpless thoughts can significantly reduce pain. For example, an athlete in training might say, "The pain means my muscles are getting stronger." Or, consider the Marine Corps slogan: "Pain is weakness leaving the body."

Can Magnets Relieve Pain?

Our students frequently ask us about different *complementary and alternative medicines (CAM).* Complementary and alternative medicines are a diverse group of health care systems, practices, or products that are *not* presently considered to be part of conventional medicine. Scientific evidence exists for some CAM therapies, such as the benefits of massage (Moyer & others, 2004). Therapies that are scientifically proven to be safe and effective usually become adopted by the mainstream health care system. However, the effectiveness and safety of many CAMs have not been proven by well-designed scientific studies.

Magnets are one popular CAM that have been used for many centuries to treat pain. But can magnets relieve pain? To date, there is no evidence supporting the idea that magnets relieve pain (National Standard Monograph, 2009). As discussed in Chapter 1 (see page 3), the pain relief that some people experience could be due to a placebo effect or expectations that pain will decrease. Or the relief could come from whatever holds the magnet in place, such as a warm bandage or the cushioned insole (Weintraub & others, 2003).

One final note: The techniques described here are *not* a substitute for seeking appropriate medical attention, especially when pain is severe, recurring, or of unknown origin. If pain persists, seek medical attention.



CHAPTER REVIEW

Sensation and Perception

KEY POINTS

Introduction: What Are Sensation and Perception?

- **Sensation** refers to the response of sensory receptors in the sense organs to stimulation and the transmission of that information to the brain. **Perception** refers to the process through which the brain organizes and interprets sensory information.
- When **sensory receptors** are stimulated by an appropriate form of energy, **transduction** converts the energy into neural impulses, which are transmitted to the brain.
- Each sense is specialized in terms of the type and level of energy to which it will respond. Sensory thresholds include the **absolute threshold** and the **difference threshold. Weber's law** states that the just noticeable difference will vary depending on the strength of the original stimulus. **Sensory adaptation** takes place when the sensory receptor cells gradually decline in sensitivity to a constant stimulus.

Vision: From Light to Sight

- The sensory receptors for vision respond to light waves. The human eye is sensitive to a very narrow, specific range of **wavelengths** in the electromagnetic energy spectrum.
- Light waves enter the eye and pass through the **cornea** and the **pupil.** The **iris** controls how much light is allowed in. Behind the pupil is the **lens,** which focuses light on the retina through **accommodation.** The retina contains the sensory receptors for vision, the rods and cones.
- **Rods** are used for vision in dim light and for peripheral vision. **Cones** are used for color vision, for vision in bright light, and for seeing fine details. Cones are concentrated in the **fovea,** while rods are more prevalent in the periphery of the retina. There are no rods or cones in the **optic disk,** which creates a **blind spot** in the visual field.

- Rods and cones send information to the **bipolar** and **ganglion cells.** The ratio of cones to ganglion cells is much smaller than the ratio of rods to ganglion cells. The **optic nerve** fibers exit the back of each retina at the optic disk and meet at the **optic chiasm,** where some of the fibers cross over to the opposite side of the brain and then transmit information from the thalamus to the visual cortex. Feature detectors are highly specialized neurons in the visual cortex.
- **Color** is the psychological experience of different wavelengths of light and involves **hue, brightness,** and **saturation.** The color of an object is determined by the light wave it reflects. In combination, the **trichromatic theory** and the **opponent-process theory** explain color vision. The trichromatic theory explains red–green **color blindness** and color processing in the retina. The opponent-process theory explains **afterimages** and color processing in the ganglion cells and the brain.

Hearing: From Vibration to Sound

- The sense of hearing is called **audition.** The **loudness, pitch,** and **timbre** of a sound are determined by the **amplitude, frequency,** and complexity of a sound wave. Loudness is measured in **decibels.**
- Sound waves are collected in the **outer ear,** amplified by the **eardrum** in the **middle ear,** and transduced in the **inner ear.** The sensory receptors for hearing are the **hair cells,** which are located on the **basilar membrane** in the **cochlea.** The auditory nerve carries information to the thalamus and auditory cortex in the brain. In combination, **frequency theory** and **place theory** explain the sensation of pitch.

The Chemical and Body Senses: Smell, Taste, Touch, and Position

- The sensory receptors for smell **(olfaction)** and taste **(gustation)** are specialized to respond to chemical substances. The sensation of smell is caused by airborne molecules stimulating odor receptors on the olfactory receptor cells in the nasal lining. Olfactory information travels via the axons of the receptor cells to the **olfactory bulb** and is transmitted along the olfactory tract to different brain areas, including the temporal lobe and limbic system. Olfactory sensitivity varies widely and tends to decline with age.
- Taste results from the stimulation of sensory receptors in the **taste buds,** which are located on the tongue and the inside of the mouth. When activated by chemical substances dissolved in saliva, the taste buds send neural messages to the thalamus in the brain. There are five primary tastes: sweet, salty, sour, bitter, and *umami.*
- The skin includes several kinds of sensory receptors, which are unevenly distributed among the parts of the body. The Pacinian corpuscle is the skin receptor that is sensitive to pressure.
- **Pain** occurs when **nociceptors** are stimulated. The fast pain system transmits signals that produce sensations of intense but short-lived pain, while the slow pain system transmits signals thatproduce sensations of dull, long-lasting pain. **Substance P** is a neurotransmitter that increases pain messages within the spinal cord. The **gate-control theory of pain** helps explain how psychological and other factors influence the subjective experience of pain.
- The **kinesthetic sense** involves the location and position of body parts in relation to one another, which is detected by specialized neurons called **proprioceptors.** The **vestibular sense** provides information about balance, equilibrium, and orientation.

Perception

- Both **bottom-up** and **top-down processing** are involved in everyday perception. The **Gestalt psychologists** emphasized the perception of *gestalts,* or whole forms.
- We rely primarily on shape to identify an object. **Figure-ground relationships** are important in distinguishing an object from its background. The Gestalt psychologists formulated several principles of perceptual organization, including the laws of proximity, similarity, closure, good continuation, and Prägnanz.
- **Depth perception** involves both monocular and binocular cues. **Monocular depth cues** include relative size, overlap, aerial perspective, texture gradient, linear perspective, motion parallax, and accommodation. **Binocular depth cues** include convergence and binocular disparity.
- The perception of movement involves integrating information from the eye muscles, the retina, and the environment. The illusion of induced motion is a result of our assumption that the background is stationary. The perception of stroboscopic motion results from images being rapidly registered on the retina.
- Objects are perceived as stable despite changes in sensory input and retinal image, a concept called **perceptual constancy. Size constancy** and **shape constancy** are two important forms of erceptual constancy.

Perceptual Illusions

- **Perceptual illusions** are used to study perceptual principles. The **Müller-Lyer illusion** involves the principles of depth cues and size constancy. The **moon illusion** results from the principles of overlap and size constancy.

The Effects of Experience on Perceptual Interpretations

- Perceptual interpretations can be influenced by learning experiences, culture, and expectations. **Perceptual set** often determines the interpretation of an ambiguous stimulus.

KEY TERMS

sensation, p. 88
perception, p. 88
sensory receptors, p. 89
transduction, p. 89
absolute threshold, p. 90
difference threshold, p. 90
Weber's law, p. 90
subliminal perception, p. 91
mere exposure effect, p. 91
sensory adaptation, p. 92
wavelength, p. 92
cornea, p. 93
pupil, p. 93
iris, p. 93
lens, p. 94
accommodation, p. 94
retina, p. 94
rods, p. 94
cones, p. 94
fovea, p. 94
optic disk, p. 94
blind spot, p. 95
ganglion cells, p. 95
bipolar cells, p. 95
optic nerve, p. 96
optic chiasm, p. 96
color, p. 93
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opponent-process theory of color vision, p. 99
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middle ear, p. 102
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basilar membrane, p. 103
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frequency theory, p. 103
place theory, p. 104
olfaction, p. 104
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size constancy, p. 122
shape constancy, p. 122
perceptual illusion, p. 123
Müller-Lyer illusion, p. 123
moon illusion, p. 123
perceptual set, p. 126
biofeedback, p. 128
acupuncture, p. 128

KEY PEOPLE

Karl Duncker (1903-1940) German Gestalt psychologist who is best known for his studies on the perception of motion; also studied the perception of pain and the effects of past experience on perception; immigrated to the United States in 1938. (p. 121)

Max Wertheimer (1880-1943) German psychologist who founded Gestalt psychology in the early 1990s, immigrated to the United States in 1933, studied the optical illusion of apparent movement, and described principles of perception. (p. 115)

CONCEPT REVIEW ANSWERS

3.1 page 100

1. transduction
2. retina
3. bipolar; ganglion; optic chiasma; visual cortex
4. trichromatic
5. blue; opponent-process

3.2 page 112

1. basilar; cochlea
2. thalamus
3. olfactory bulb
4. conduction deafness
5. substance P
6. kinesthetic

3.3 page 120

1. *Relative size.* The people, trees, and lampposts toward the bottom of the photo seem closer because they are larger than those toward the center of the photo.
2. *Overlap.* Many objects in the photograph are partially obscured by other objects—such as the trees, lampposts, windows, and towers. In each case, the object that is not obscured is perceived as being closer.
3. *Aerial perspective.* The towers toward the top of the photo are fuzzy and slightly blurred, and thus they are perceived as being farther away.
4. *Texture gradient.* Details of the cobblestones, people, trees, and lampposts are crisp in the foreground but become progressively more blurred as you move toward the top of the photograph.
5. *Linear perspective.* The cobblestones and the lines of trees and lampposts seem to be converging toward the middle of the photo, creating a sense of greater distance.

3.4 page 127

1. figure; ground
2. size constancy; shape constancy
3. proximity
4. similarity
5. perceptual set

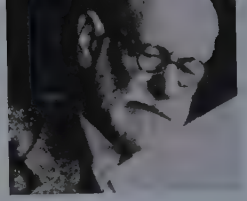


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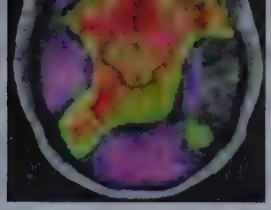


CHAPTER 4

Consciousness and Its Variations







A Knife in the Dark

PROLOGUE

SCOTT HAD SOME SLEEPWALKING episodes as he was growing up, but his parents weren't overly concerned about them. Sleepwalking is pretty common among kids. "I remember Scott getting dressed at midnight, glassy-eyed, saying he had to go to school," Scott's mother recalled. Scott wasn't the only sleepwalker in the family. Two of his younger siblings were also sleepwalkers.

Scott's sister, Laura, remembers another sleepwalking incident. At the time, she was 15 and Scott was five years older. "Scott was getting ready to get married that June and he was coming up on college finals, and he was stressing," Laura recalled. Scott wandered into the kitchen with a glazed facial expression. As he reached the back door and began fumbling with the doorknob, Laura realized that her older brother was sleepwalking. She quickly leaned around him to lock the deadbolt. That's when Scott grabbed her. "He kind of lifted me up and tossed me," Laura recalls. "His face looked almost demonic when he reacted to me. It really scared the hell out of me."

Scott eventually married his high school sweetheart, Yarmila, and had two children. The family settled in Phoenix and Scott worked as a managing engineer for a technology company. By all accounts, Scott and Yarmila's marriage was happy, revolving around their children and Scott's involvement with a teen ministry program at their church.

During most of 1996, Scott was under tremendous pressure at work. A new product line that Scott's team had been developing—a hard drive chip—was not living up to its promise. But abandoning the project would also eliminate his co-workers' jobs. It was a no-win situation.

The work pressure continued. Scott often went for night after night with three hours of sleep or less. To stay alert and focused at work, he resorted to taking caffeine tablets, 200 milligrams a pop. After several nights in a row with very little sleep, Scott would "crash" early to catch up on his sleep.

Finally, Scott got into a heated exchange with his boss. It was decided that the following day Scott would meet with his work group and explain that their project would probably be cancelled.

At dinner that night, Scott discussed the troubling work situation with his family. Around 9:00 P.M., after the kids were in bed, Scott went out to the backyard to work on the broken swimming pool pump, but eventually gave up.

Back in the house, Yarmila had fallen asleep on the couch in the family room, the television still on. It was close to 10:00 P.M. Scott kissed her good night, went upstairs, changed into his pajama bottoms, and "crashed."

IN THIS CHAPTER:

- Introduction: Consciousness: Experiencing the "Private I"
- Biological and Environmental "Clocks" That Regulate Consciousness
- Sleep
- Dreams and Mental Activity During Sleep
- Sleep Disorders
- Hypnosis
- Meditation
- Psychoactive Drugs
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Stimulus Control Therapy for Insomnia

Less than an hour later, Scott was startled awake by the sound of their two dogs barking wildly. Disoriented and confused, he rushed downstairs. Two police officers, guns drawn, yelled at him to get facedown on the floor.

"What's going on?" Scott asked as he complied.

For an hour, Scott sat handcuffed in the back of a police car. He caught bits and pieces of the comments being made by the police officers and emergency personnel. At first he thought that Yarmila had been seriously hurt and that the police were searching for the person who had done it. But then he realized he was wrong. Yarmila was dead.

It was almost 2:00 A.M. when a Phoenix Police Department detective began interrogating Scott. "What set this thing off, got it going?" the detective asked.

As he sat huddled in the corner of the interrogation room, Scott replied, "Obviously, you think I killed her. I don't know what makes you think that."

"Because a neighbor watched you do it, that's why."

"I'm sorry. I don't remember doing it," Scott answered, then paused. "How did she die?"

"Well, the neighbor says you stabbed her and dragged her over to the pool and held her under the water. From what people are telling me about you guys, you spend a lot of time in the church. A quiet family, so this is really out of character. I want to know what went on, what would lead to something like this? What did she do to set you off like that?"

"Nothing."

"Okay, then what did *you* do to set yourself off like that? Something set you off, Scott."

"I'm sorry, I just don't know."



Phoenix Police Department, Public Records

"Nothing went wrong?"

"I love my wife. I love my kids."

Scott had stabbed Yarmila 44 times, then left her floating facedown in the pool. But he had no memory of his actions.

Could Scott have unknowingly committed such violent acts while he was sleepwalking? Is it possible for someone to carry out complex actions, like driving, while asleep?

In this chapter, we'll tackle those questions and others as we explore variations in our experience of consciousness. As you'll see, psychologists have learned a great deal about our daily fluctuations of consciousness. Psychologists have also gained insight into the different ways that alterations in consciousness can be induced, such as through the use of hypnosis, meditation, or psychoactive drugs. We'll return to Scott's story to help illustrate some of these concepts.



Introduction: Consciousness

Experiencing the "Private I"

KEY THEME

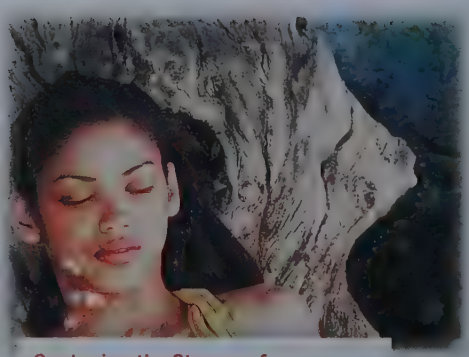
› Consciousness refers to your immediate awareness of mental activity, internal sensations, and external stimuli.

KEY QUESTIONS

› What did William James mean by the phrase *stream of consciousness?*

› What are the functions of consciousness?

› How is attention defined, and how do the limitations of attention affect human thought and behavior?



Moodboard/Corbis

Capturing the Stream of Consciousness One thought, memory, or fantasy seems to blend seamlessly into another.

What is *consciousness?* Psychologists have studied consciousness for over a century, yet its nature is difficult to define precisely. For our purposes, we'll use a simple definition: **consciousness** is your immediate awareness of thoughts, sensations, memories, and the world around you.

Take a few moments to pay attention to your own experience of consciousness. You'll notice that the contents of your awareness shift from one moment to the next. Among other activities, your mental experience might include *focused attention* on this textbook; *awareness of internal sensations,* such as hunger or a throbbing

headache; and *planning* or *active problem-solving*, such as mentally rehearsing an upcoming meeting with your adviser.

Even though your conscious experience is constantly changing, you don't experience your personal consciousness as disjointed. Rather, the subjective experience of consciousness has a sense of continuity. This characteristic of consciousness led the influential American psychologist **William James** (1892) to describe consciousness as a "stream" or "river." Despite the changing focus of our awareness, our experience of consciousness as an unbroken "stream" helps provide us with a sense of personal identity that has continuity from one day to the next.

Consciousness allows us to integrate past, present, and future behavior, guide future actions, and maintain a stable sense of self (Baumeister & others, 2011, 2010). And, it gives us the ability to plan and execute long-term, complex goals and communicate with others.

Our definition of consciousness refers to waking awareness. However, psychologists also study other types of conscious experience, which we'll consider later in the chapter. But first, we'll take a closer look at the nature of awareness.



Consciousness, then, does not appear to itself chopped up in bits.... It is nothing jointed; it flows. A "river" or a "stream" are the metaphors by which it is most naturally described. In talking of it hereafter, let us call it the stream of thought, or consciousness, of subjective life.

William James (1892)

Attention: The Mind's Spotlight

Lost in your thoughts, you don't notice when your instructor calls on you in class. "Pay attention!" your professor says patiently.

But what *is* attention? In reality, you are always "paying attention" to *something*—just not always the stimuli that you're *supposed* to be paying attention to. For example, when your mind "wanders," you are focusing on your internal environment—your daydreams or thoughts—rather than your external environment (Smilek & others, 2010).

Like *consciousness, attention* is one of the oldest topics in psychology (Raz, 2009). And, like consciousness, attention is difficult to define precisely.

For our purposes, we'll define **attention** as the capacity to selectively focus senses and awareness on particular stimuli or aspects of the environment (Chun & others, 2011; Posner & Rothbart, 2007). Most of the time, we are able to deliberately control our attentional processes, which helps us regulate our thoughts and feelings. For example, we may deliberately turn our attention to a pleasant thought or memory when troubled by a painful memory (Baumeister & others, 2010, 2011).

Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought.... It implies withdrawal from some things in order to deal effectively with others.

William James (1890)

Psychologists have identified a number of characteristics of attention, some of which have important implications for our daily life. These are:

1. *Attention has a limited capacity.*

At any given moment we are faced with more information than we can effectively process. We cannot pay attention to *all* of the sights, sounds, or other sensations in our external environments. Similarly, the range of potential thoughts, memories, or fantasies available to us at any given time is overwhelming. Thus, we focus our attention on information that is most relevant to our immediate or long-term goals (Chun & others, 2011; Lachter & others, 2004).

2. *Attention is selective.*

Attention is often compared to a *spotlight* that we shine on particular external stimuli or internal thoughts. Like a spotlight, we focus on certain areas of our experience while ignoring others (Dijksterhuis & Aarts, 2010).

A classic example of the selective nature of attention is the *cocktail party effect* (Hill & Miller, 2010). If you're at a crowded, noisy party, you're literally engulfed in a sea of auditory stimuli. But, you are able to attend to one stream of speech while ignoring others that compete for your attention (Koch & others, 2011; Xian & others, 2010).

Although you can monitor multiple streams of information, you can only truly pay attention to *one* stream of speech at a time. So, at the same party, you are *somewhat*

consciousness Personal awareness of mental activities, internal sensations, and the external environment.

attention The capacity to selectively focus awareness on particular stimuli in your external environment or on your internal thoughts or sensations.

Did You See That Clown? Do you think you would notice if a unicycling clown crossed your path? Probably—unless you were using a cell phone! Fully three-quarters of those who were talking on their cell phones did *not* see the clown as they walked across a busy campus square—an example of *inattentional blindness*. In contrast, most people walking alone, with a friend, or listening to music *did* see the clown (Hyman & others, 2010).



Photo courtesy Ira Hyman. © John Wiley & Sons, Ltd.

aware of information that is going on in the background, even though you're not actively paying attention to it (Raz, 2009). For example, if you hear your name mentioned by someone in a different conversational group, you will probably shift your attention to the other conversation and strain your ears to hear what is being said about you. Meanwhile, your best friend has been talking to you, and you haven't heard a word he's said. Sound familiar?

3. *Attention can be "blind."*

Given the limited, selective nature of attention, you shouldn't be surprised to learn that we often completely miss what seem to be obvious stimuli in our field of vision or hearing. For example, magicians exploit the limited, selective nature of attention with a strategy called *misdirection* (Lamont & others, 2010). They deliberately draw the audience's attention away from the "method," or secret action, and towards the "effect," which refers to what the magician wants the audience to perceive (Macknik & others, 2008; Raz, 2009). To experience a bit of magic firsthand, direct your attention to Figure 4.1.

Magicians also exploit a basic human tendency known as *inattentional blindness,* which occurs when we simply don't notice some significant object or event that is in our clear field of vision (Mack & Rock, 2000). Because we have a limited capacity for attention, the more attention we devote to one task, the less we have for another. Thus, when we are engaged in one task that demands a great deal of our attention, we may fail to notice an event or object, especially if it is unexpected or unusual.

For example, if a clown on a unicycle crossed your path while you were walking across campus, do you think you would notice? Psychologist Ira Hyman enlisted a student to dress up as a clown and slowly unicycle across a busy campus square (Hyman & others, 2010). Researchers later stopped people whose paths had crossed with the unicycling clown and asked them whether they had seen him. Most of the people who were walking alone, in pairs, or who were listening to iPods *did* notice the clown. However, only one-quarter of those talking on cell phones noticed the clown.

We can also experience *inattentional deafness* (Macdonald & Lavie, 2011). Most of us have been so engrossed in a book or video that we failed to hear a roommate's question.

Finally, *change blindness* is also relatively common. Change blindness refers to not noticing when something changes, such as when a friend gets a haircut or shaves his beard (Rosielle & Scaggs, 2008). Were you fooled by the magic trick in Figure 4.1? If so, you can blame change blindness.

FIGURE 4.1(a) Can We Read Your Mind?
We'd like you to participate in a mind-reading experiment. Please follow all directions as carefully as you can.
First, pick one of the six cards below and remember it.



Say its name aloud several times so you won't forget it. Once you're sure you'll remember it, circle one of the eyes in the row below. Then turn to page 138.



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The Perils of Multi-Tasking

Multi-tasking refers to paying attention to two or more sources of stimuli at once—such as doing homework while watching television, or talking on the phone while cooking dinner. In essence, multi-tasking involves the *division of attention*. When attention is divided among different tasks, each task receives less attention than it would normally (Borst & others, 2010; Lavie, 2010). Some people *are* better at handling multiple tasks than others (Seegmiller & others, 2011). Nevertheless, no one has an infinite quantity of attention.

In general, tasks that are very different are less likely to interfere with each other. There is evidence that visual and auditory tasks draw on independent, different attention resources—at least for simple, well-rehearsed tasks. For example, listening to the radio (an auditory task) interferes less with driving (a visual task) than would a second visual task (Borst & others, 2010). However, this is *not* the case when one of the tasks requires a great deal of concentration. Absorption in a visual task can produce inattentional deafness, and absorption in an auditory task can produce inattentional blindness (Macdonald & Lavie, 2011).

The perils of divided attention are especially obvious when people use cell phones. As evidenced by the unicycling clown study, using a cell phone seems to absorb a great deal of attentional resources. Partly because cell phone conversations can be so absorbing, they are especially likely to produce inattentional blindness (Chabris & Simons, 2010). One study found that driving was more impaired when drivers were talking on a cell phone than when the same drivers were legally drunk (Strayer & others, 2006). And, it turns out, using a headset or Bluetooth device while driving does not improve safety. It's the *attention* devoted to the conversation that is dangerously distracting to drivers (see Baumeister & others, 2011; Drews & others, 2008).

Distractions are just one factor that affects the quality of awareness. We'll begin our exploration of variations in consciousness by looking at the biological rhythms that help determine the nature and quality of our daily conscious experience.

circadian rhythm (ser-KADE-ee-en) A cycle or rhythm that is roughly 24 hours long; the cyclical daily fluctuations in biological and psychological processes.

Biological and Environmental "Clocks" That Regulate Consciousness

KEY THEME

› Many body functions, including mental alertness, are regulated by circadian rhythms, which systematically vary over a 24-hour period.

KEY QUESTIONS

› How do sunlight, the suprachiasmatic nucleus, and melatonin regulate the sleep–wake cycle?

› What is jet lag, and how is it produced?

Throughout the course of each day, there is a natural ebb and flow to consciousness. The most obvious variation of consciousness that we experience is the daily sleep–wake cycle. However, researchers have identified more than 100 other physical and psychological processes that rhythmically peak and dip at consistent times each day, including blood pressure, the secretion of different hormones, mental alertness, and pain sensitivity.

Each of those examples represents a specific **circadian rhythm.** The word *circadian* combines the Latin words for "about" and "day." So, the term *circadian rhythm* refers to a biological or psychological process that systematically varies over the course of each day.



Hans Wiedl/Newscom

The Emergence of Circadian Rhythms Consistent daily variations in movement, heart rate, and other variables are evident during the fifth month of gestation in the human fetus. After birth, the synchronization of infants' circadian rhythms to a day–night cycle usually occurs by 2 or 3 months of age (Mistlberger & Rusak, 2005). Daytime exposure to bright light helps establish these regular rest–activity circadian rhythms.

suprachiasmatic nucleus (SCN) (soup-rah-*kye*-az-MAT-ick) A cluster of neurons in the hypothalamus in the brain that governs the timing of circadian rhythms.

melatonin (mel-ah-TONE-in) A hormone manufactured by the pineal gland that produces sleepiness.

TABLE 4.1

Examples of Human Circadian Rhythms

Function	Typical Circadian Rhythm
Peak mental alertness and memory	Two daily peaks: around 9:00 A.M. and 9:00 P.M.
Lowest body temperature	About 97°F around 4:00 A.M.
Highest body temperature	About 99°F around 4:00 P.M.
Peak hearing, visual, taste, and smell sensitivity	Two daily peaks: around 3:00 A.M. and 6:00 P.M.
Lowest sensitivity to pain	Around 4:00 P.M.
Peak sensitivity to pain	Around 4:00 A.M.
Peak degree of sleepiness	Two daily peaks: around 3:00 A.M. and 3:00 P.M.
Peak melatonin hormone in blood	Between 1:00 A.M. and 3:00 A.M.

Sources: Campbell (1997); Czeisler & Dijk (2001); Refinetti (2000); M. Young (2000).

Normally, your different circadian rhythms are closely synchronized. For example, the circadian rhythm for the release of growth hormone is synchronized with the sleep–wake circadian rhythm so that growth hormone is released only during sleep. Table 4.1 lists other examples of circadian rhythms.

The Suprachiasmatic Nucleus

The Body's Clock

Your many circadian rhythms are controlled by a master biological clock—a tiny cluster of neurons in the *hypothalamus* in the brain. As shown in Figure 4.2, this cluster of neurons is called the **suprachiasmatic nucleus,** abbreviated **SCN.** The SCN is the internal pacemaker that governs the timing of circadian rhythms, including the sleep–wake cycle (R. Moore, 2007).

Keeping the circadian rhythms synchronized with one another and on a 24-hour schedule also involves environmental time cues. The most important of these cues is bright light, especially sunlight. In people, light detected by special photoreceptors in the eye is communicated via the visual system to the SCN in the hypothalamus (Drouyer & others, 2007; Zaidi & others, 2007).

How does sunlight help regulate the sleep–wake cycle and other circadian rhythms? As the sun sets each day, the decrease in available light is detected by the SCN through its connections with the visual system. In turn, the SCN triggers an increase in the production of a hormone called **melatonin.** Melatonin is manufactured by the *pineal gland,* an endocrine gland located in the brain.

Increased blood levels of melatonin help make you sleepy and reduce activity levels. At night, blood levels of melatonin rise, peaking between 1:00 and 3:00 A.M. Shortly before sunrise, the pineal gland all but stops producing melatonin, and you



FIGURE 4.1(b) Take a close look. Is your card missing? If so, we correctly identified the card you chose! Did we successfully read your mind?

Are your authors incredibly skilled mind-readers? Or could there be another explanation? If you can't figure out how we performed this magic trick, you can find the solution on page 181.

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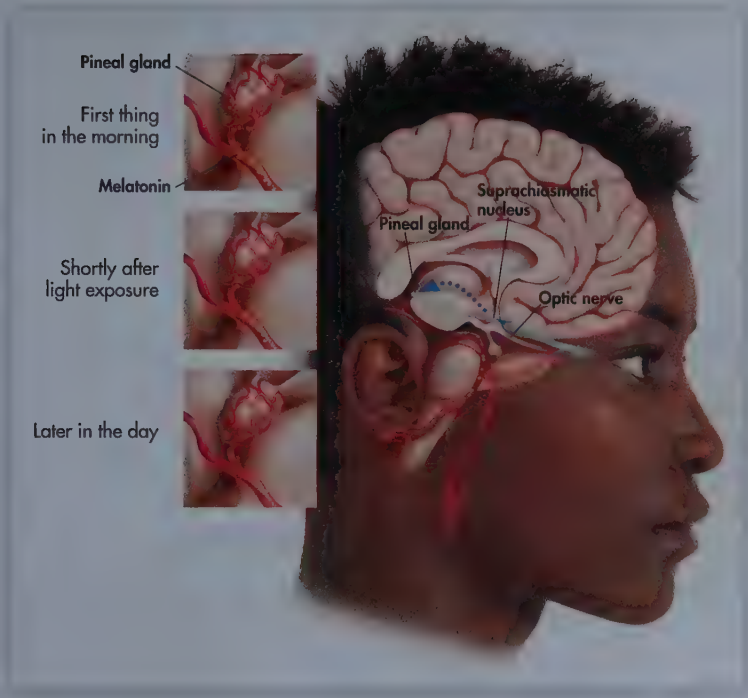


FIGURE 4.2 The Biological Clock Special photoreceptors in the retina regulate the effects of light on the body's circadian rhythms (Menaker, 2003). In response to morning light, signals from these special photoreceptors are relayed via the optic nerve to the suprachiasmatic nucleus. In turn, the suprachiasmatic nucleus reduces the pineal gland's production of melatonin, a hormone that causes sleepiness. As blood levels of melatonin decrease, mental alertness increases. Daily exposure to bright light, especially sunlight, helps keep the body's circadian rhythms synchronized and operating on a 24-hour schedule.

soon wake up. As the sun rises, exposure to sunlight and other bright light suppresses melatonin levels, and they remain very low throughout the day. In this way, sunlight regulates, or *entrains,* the SCN so that it keeps your circadian cycles synchronized and operating on a 24-hour schedule.

Circadian Rhythms and Sunlight: The 24.2-Hour Day

Sunlight plays a critical role in regulating your internal clock. What would happen if you were deprived of all environmental time cues, like sunlight/darkness cues, clocks, and schedules? In the absence of all external time cues, researchers have found that our internal body clock drifts to its natural—or *intrinsic*—rhythm. Interestingly, our intrinsic circadian rhythm is about 24.2 hours, or slightly *longer* than a day (Czeisler & Gooley, 2007).

When there are no external time cues, our normally coordinated circadian rhythms become desynchronized (Dijk & Lockley, 2002). For example, your sleep–wake, body temperature, and melatonin cycles are usually very closely coordinated. At about 3:00 A.M., your body temperature dips to its lowest point just as melatonin is reaching its highest level and you are at your sleepiest. But when deprived of all environmental time cues, the sleep–wake, body temperature, and melatonin circadian rhythms become desynchronized so that they are no longer properly coordinated with one another.

Exposure to environmental time signals is necessary for us to stay precisely synchronized, or *entrained,* to a 24-hour day. Practically speaking, this has some important applications. For example, imagine that you leave Denver at 2:00 P.M. on a 10-hour flight to London. When you arrive in London, it's 7:00 A.M and the sun is shining. However, your body is still on Denver time. As far as your internal biological clock is concerned, it's midnight.

The result? Your circadian rhythms are drastically out of synchronization with daylight and darkness cues. Thinking, concentration, and memory get fuzzy. You experience physical and mental fatigue, depression or irritability, and disrupted sleep (Eastman & others, 2005). Collectively, these symptoms are called *jet lag.*

Circadian Rhythms and the Blind Many blind people have desynchronized circadian rhythms because they're unable to detect the sunlight that normally sets the body's internal biological clock, the SCN. Like sighted people deprived of all environmental time cues, blind people can experience desynchronized melatonin, body temperature, and sleep–wake circadian cycles. Consequently, about 60 percent of blind people suffer from recurring bouts of insomnia and other sleep problems (Arendt & others, 2005; Mistlberger & Skene, 2005).



Kieran Doherty/Reuters/Corbis

electroencephalograph (e-lec-tro-en-SEFF-uh-low-graph) An instrument that uses electrodes placed on the scalp to measure and record the brain's electrical activity.

EEG (electroencephalogram) The graphic record of brain activity produced by an electroencephalograph.

REM sleep Type of sleep during which rapid eye movements (REM) and dreaming usually occur and voluntary muscle activity is suppressed; also called *active sleep* or *paradoxical sleep.*

NREM sleep Quiet, typically dreamless sleep in which rapid eye movements are absent; divided into four stages; also called *quiet sleep.*

sleep paralysis A temporary condition in which a person is unable to move upon awakening in the morning or during the night.

Although numerous physiological variables are involved in jet lag, the circadian cycle of the hormone melatonin plays a key role. When it's 10:00 A.M in London, it's 3:00 A.M in Denver. Since your body is still operating on Denver time, your melatonin production is peaking. Rather than feeling awake, you feel very sleepy, sluggish, and groggy. For many people, it can take a week or longer to fully adjust to such an extreme time change.

Sleep

KEY THEME

› Modern sleep research began with the invention of the EEG and the discovery that sleep is marked by distinct physiological processes and stages.

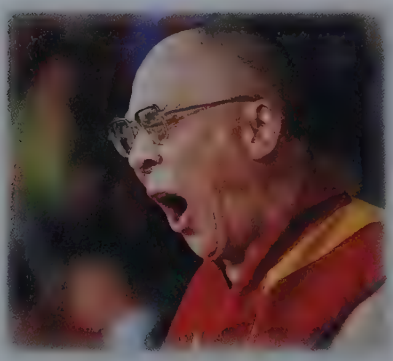
KEY QUESTIONS

› What characterizes sleep onset, the NREM sleep stages, and REM sleep?

› What is the typical progression of sleep cycles? How do sleep patterns change over the lifespan?

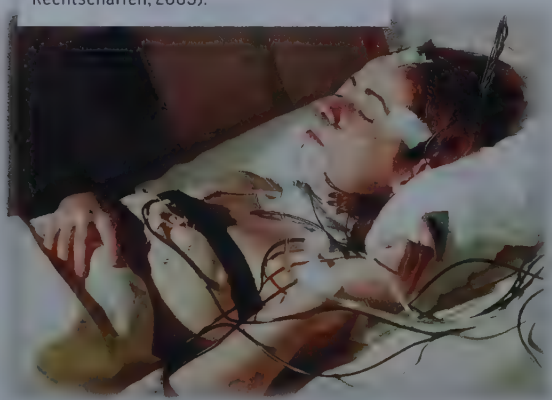
› What evidence suggests that we have a biological need for sleep?

From Aristotle to Shakespeare to Freud, history is filled with examples of scholars, writers, and scientists who have been fascinated by sleep and dreams. But prior to the twentieth century, there was no objective way to study the internal processes that might be occurring during sleep. Instead, sleep was largely viewed as a period of restful inactivity in which dreams sometimes occurred.



AP Photo/Vincent Yu

Wired for Sleep Using electrodes pasted to the scalp, the *electroencephalogram* (EEG) detects changes in the brain's electrical activity. Other instruments record eye and muscle movements, respirations, heart rate, and airflow. Although it may look uncomfortable, most people involved in sleep studies become oblivious to the electrodes and wires as they drift into sleep (Carskadon & Rechtschaffen, 2005).



Garo/Phanie/Photo Researchers

The Dawn of Modern Sleep Research

The invention of the **electroencephalograph** by German psychiatrist Hans Berger in the 1920s gave sleep researchers an important tool for measuring the rhythmic electrical activity of the brain (Stern, 2001). These rhythmical patterns of electrical activity are referred to as *brain waves.* The electroencephalograph produces a graphic record called an **EEG,** or **electroencephalogram.** By studying EEGs, sleep researchers firmly established that brain-wave activity systematically changes throughout sleep.

Along with brain activity, today's sleep researchers monitor a variety of other physical functions during sleep. Eye movements, muscle movements, breathing rate, airflow, pulse, blood pressure, amount of exhaled carbon dioxide, body temperature, and breathing sounds are just some of the body's functions that are measured in contemporary sleep research (Carskadon & Dement, 2005).

What happens during sleep? Most people tend to think of sleep as an "either/or" condition—the brain is *either* awake and active, *or* asleep and idle. In fact, sleep researchers know that the sleeping brain doesn't just shut down during sleep. The sleeping brain remains active, although its patterns of activity are distinctly different from the patterns displayed by the waking brain.

Research also disputes the notion that sleep is a global, brain-wide state (Colwell, 2011). It turns out that during sleep, some brain areas, and even some brain neurons, remain active, while others do not (Nir, 2011; Vyazovskiy & others, 2011).

Sleep researchers distinguish between two basic types of sleep. **REM sleep,** or *rapid-eye-movement sleep,* is often called *active sleep* or *paradoxical sleep* because it is associated with heightened body and brain activity during which dreaming consistently occurs. **NREM sleep,** or *non-rapid-eye-movement sleep,* is often referred to as *quiet sleep* because the body's physiological functions and brain activity slow down during this period of slumber. Usually pronounced as "Non-REM sleep," it is further divided into four stages, as we'll describe shortly.

IN FOCUS

What You Really Want to Know About Sleep

Why do I yawn?

Researchers aren't certain. But the notion that too little oxygen or too much carbon dioxide causes yawning is not supported by research. Some evidence suggests that yawning regulates and increases your level of arousal. Yawning is typically followed by an *increase* in activity level. Hence, you frequently yawn after waking up in the morning, while attempting to stay awake in the late evening, or when you're bored.

Is yawning contagious?

Seeing, hearing, or thinking about yawning can trigger a yawn. More than half of adults will yawn when they're shown videos of other people yawning. Blind people will yawn more frequently in response to audio recordings of yawning. Some psychologists believe that contagious yawning is related to our ability to feel empathy for others. (Have you yawned yet?) Interestingly, chimpanzees and macaques, both highly social animals, display contagious yawning. And so do domestic dogs, which in a recent study were shown to "catch" yawns from human strangers. From an evolutionary perspective, such observations lend support to the idea that contagious yawning may have evolved as an adaptive social cue, allowing groups to signal and coordinate times of activity and rest. In support of that view, a new study found that chimpanzees yawn more after viewing iTouch videos of other chimpanzees yawning—but *only* if the chimps were members of their own social group.

Why do I get sleepy?

A naturally occurring compound in the body called *adenosine* may be the culprit. In studies with cats, prolonged wakefulness sharply increases adenosine levels, which reflect energy used for brain and body activity. As adenosine levels shoot up, so does the need for sleep. Slow-wave NREM sleep reduces adenosine levels. In humans, the common stimulant drug caffeine blocks adenosine receptors, promoting wakefulness.

Sometimes in the morning when I first wake up, I can't move. I'm literally paralyzed! Is this normal?

REM sleep is characterized by paralysis of the voluntary muscles, which keeps you from acting out your dreams. In a relatively common phenomenon called **sleep paralysis,** the paralysis of REM sleep carries over to the waking state for up to 10 minutes. If preceded by an unpleasant dream or hypnagogic experience, this sensation can be frightening. Sleep paralysis can also occur as you're falling asleep. In either case, the sleep paralysis lasts for only a few minutes. So, if this happens to you, relax—voluntary muscle control will soon return.



Getty Images

Do deaf people who use sign language sometimes "sleep sign" during sleep?

Yes.

Do the things people say when they talk in their sleep make any sense?

Sleeptalking typically occurs during NREM stages 3 and 4. There are many anecdotes of spouses who have supposedly engaged their sleeptalking mates in extended conversations, but sleep researchers have been unsuccessful in having extended dialogues with people who chronically talk in their sleep. As for the truthfulness of the sleeptalker's utterances, they're reasonably accurate insofar as they reflect whatever the person is responding to while asleep. By the way, not only do people talk in their sleep, but they can also sing or laugh in their sleep. In one case we know of, a little boy sleepsang "Frosty the Snowman."

Is it dangerous to wake a sleepwalker?

As a general rule, no, it's not dangerous to wake a sleepwalker. Sleepwalking tends to occur during the first third of the night when the deep, slow-wave sleep of stages 3 and 4 NREM is occurring. Consequently, it's difficult to rouse the person from deep sleep and, even if you do, the sleepwalker may be confused and have no memory of sleepwalking. Although their judgment is impaired, most sleepwalkers usually respond to verbal suggestions and can be guided back to bed.

However, without realizing what they are doing, some sleepwalkers can respond aggressively, even violently, if touched. In the prologue, this occurred on a couple of occasions to Scott as he was growing up. A little later, we'll take a more detailed look at sleepwalking and violent sleep behavior.



AP Photo/Nam Y. Huh

Sources: Campbell & de Waal (2011); Campbell & others (2009); Cartwright (2004); Empson (2002); Joly-Mascheroni & others (2008); Landolt (2008); Platek & others (2005); Pressman (2007); Rétey & others (2005); Takeuchi & others (2002).

beta brain waves Brain-wave pattern associated with alert wakefulness.

alpha brain waves Brain-wave pattern associated with relaxed wakefulness and drowsiness.

hypnagogic hallucinations (hip-na-GAH-jick) Vivid sensory phenomena that occur during the onset of sleep.

sleep spindles Short bursts of brain activity that characterize stage 2 NREM sleep.

K complex Single but large high-voltage spike of brain activity that characterizes stage 2 NREM sleep.

The Onset of Sleep and Hypnagogic Hallucinations

Awake and reasonably alert as you prepare for bed, your brain generates small, fast brain waves, called **beta brain waves.** After your head hits the pillow and you close your eyes, your muscles relax. Your brain's electrical activity gradually gears down, generating slightly larger and slower **alpha brain waves.** As drowsiness sets in, your thoughts may wander and become less logical.

During this drowsy, presleep phase, you may experience odd but vividly realistic sensations. You may hear your name called or a loud crash, feel as if you're falling, floating, or flying, or see kaleidoscopic patterns or an unfolding landscape. These brief, vivid sensory phenomena that occasionally occur during the transition to light sleep are called **hypnagogic hallucinations.** Some hypnagogic hallucinations can be so vivid or startling that they cause a sudden awakening (Vaughn & D'Cruz, 2005). Hypnagogic imagery may also reflect daily activities and preoccupations. For example, about a third of participants who learned a new video game, *Alpine Racer II*, reported hypnagogic images related to the skiing game (Schwartz, 2010; Wamsley & others, 2010).

Probably the most common hypnagogic hallucination is the vivid sensation of falling. The sensation of falling is often accompanied by a *myoclonic jerk*—an involuntary muscle spasm of the whole body that jolts the person completely awake. Also known as *sleep starts,* these experiences can seem really weird (or embarrassing) when they occur. But you can rest assured because hypnagogic hallucinations and sleep starts are normal—if not completely understood—events that sometimes occur during sleep onset (Mahowald, 2005).

GARFIELD



The First 90 Minutes of Sleep and Beyond

The course of a normal night's sleep follows a relatively consistent cyclical pattern. As you drift off to sleep, you enter NREM sleep and begin a progression through the four NREM sleep stages (see Figure 4.3). Each progressive NREM sleep stage is characterized by corresponding decreases in brain and body activity. On average, the progression through the first four stages of NREM sleep occupies the first 50 to 70 minutes of sleep.

Stage 1 NREM

As the alpha brain waves of drowsiness are replaced by even slower *theta brain waves,* you enter the first stage of sleep. Lasting only a few minutes, stage 1 is a transitional stage during which you gradually disengage from the sensations of the surrounding

Synchronized Sleepers As these time-lapse photographs show, couples who regularly sleep in the same bed tend to have synchronized sleep cycles. Since bed partners fall asleep at about the same time, they are likely to have similarly timed NREM–REM sleep cycles. The movements of this couple are also synchronized. Both sleepers shift position just before and after episodes of REM sleep.



(all) Ted Spagna/Photo Researchers

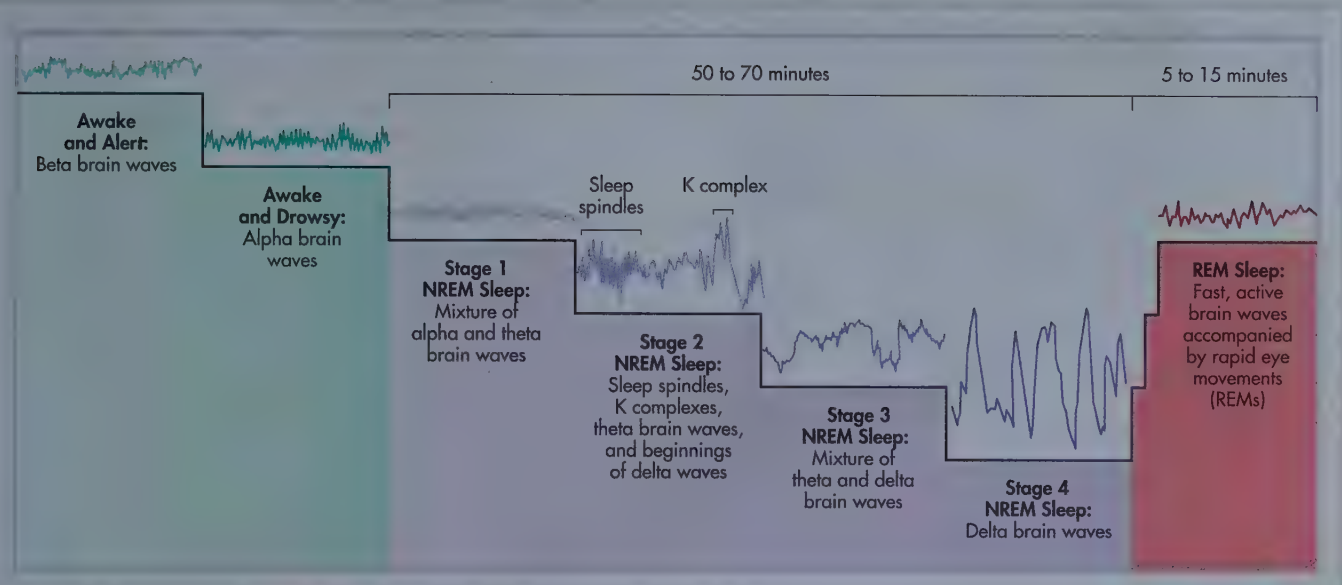


FIGURE 4.3 The First 90 Minutes of Sleep From wakefulness to the deepest sleep of stage 4 NREM, the brain's activity, measured by EEG recordings, progressively diminishes, as demonstrated by larger and slower brain waves. The four NREM stages occupy the first 50 to 70 minutes of sleep. Then, in a matter of minutes, the brain cycles back to smaller, faster brain waves, and the sleeper experiences the night's first episode of dreaming REM sleep, which lasts 5 to 15 minutes. During the rest of the night, the sleeper continues to experience 90-minute cycles of alternating NREM and REM sleep.

Source: Based on Carskadon & Dement (2005).

world. Familiar sounds, such as the hum of the refrigerator or the sound of traffic, gradually fade from conscious awareness. During stage 1 NREM, you can quickly regain conscious alertness if needed. Although hypnagogic experiences can occur in stage 1, less vivid mental imagery is common, such as imagining yourself engaged in some everyday activity. These imaginations lack the unfolding, storylike details of a true dream.

Stage 2 NREM

Stage 2 represents the onset of true sleep. Stage 2 sleep is defined by the appearance of **sleep spindles,** brief bursts of brain activity that last a second or two, and **K complexes,** single high-voltage spikes of brain activity (see Figure 4.3). Other than these occasional sleep spindles and K complexes, brain activity continues to slow down considerably. Breathing becomes rhythmical. Slight muscle twitches may occur. Theta waves are predominant in stage 2, but larger, slower brain waves, called *delta brain waves,* also begin to emerge. During the 15 to 20 minutes initially spent in stage 2, delta brain-wave activity gradually increases.

Stage 3 and Stage 4 NREM

In combination, stages 3 and 4 are often referred to as *slow-wave sleep* (SWS). Both stages are defined by the amount of delta brain-wave activity. When delta brain waves represent more than 20 percent of total brain activity, the sleeper is said to be in stage 3 NREM. When delta brain waves exceed 50 percent of total brain activity, the sleeper is said to be in stage 4 NREM.

During the 20 to 40 minutes spent in the night's first episode of stage 4 NREM, delta waves eventually come to represent 100 percent of brain activity. At that point, heart rate, blood pressure, and breathing rate drop to their lowest levels. Not surprisingly, the sleeper is almost completely oblivious to the world. Noises as loud as 90 decibels may fail to wake him. However, his muscles are still capable of movement. For example, sleepwalking typically occurs during stage 4 NREM sleep.

It can easily take 15 minutes or longer to regain full waking consciousness from stage 4. It's even possible to answer your cell phone or respond to a text message, carry on a conversation for several minutes, and hang up without ever leaving stage 4 sleep—and without remembering having done so the next day. When people are briefly awakened by sleep researchers during stage 4 NREM and asked to perform some simple task, they often don't remember it the next morning.

Thus far, the sleeper is approximately 70 minutes into a typical night's sleep and immersed in deeply relaxed stage 4 NREM sleep. At this point, the sequence reverses. In a matter of minutes, the sleeper cycles back from stage 4 to stage 3 to stage 2 and enters a dramatic new phase: the night's first episode of REM sleep.

REM Sleep

During REM sleep, the brain becomes more active, generating smaller and faster brain waves. Visual and motor neurons in the brain activate repeatedly, just as they do during wakefulness. Dreams usually occur during REM sleep. Although the brain is very active, voluntary muscle activity is suppressed, which prevents the dreaming sleeper from acting out her dreams.

REM sleep is accompanied by considerable physiological arousal. The sleeper's eyes dart back and forth behind closed eyelids—the rapid eye movements. Heart rate, blood pressure, and respirations can fluctuate up and down, sometimes extremely. Muscle twitches occur. In both sexes, sexual arousal may occur, which is not necessarily related to dream content.

This first REM episode tends to be brief, about 5 to 15 minutes. From the beginning of stage 1 NREM sleep through the completion of the first episode of REM sleep, about 90 minutes have elapsed.

Beyond the First 90 Minutes

Throughout the rest of the night, the sleeper cycles between NREM and REM sleep. Each sleep cycle lasts about 90 minutes on average, but the duration of cycles may vary from 70 to 120 minutes. Usually, four more 90-minute cycles of NREM and REM sleep occur during the night. Just before and after REM periods, the sleeper typically shifts position.

The progression of a typical night's sleep cycles is depicted in Figure 4.4. Stages 3 and 4 NREM, slow-wave sleep, usually occur only during the first two 90-minute cycles. As the night progresses, REM sleep episodes become increasingly longer and less time is spent in NREM. During the last two 90-minute sleep cycles before awakening, NREM sleep is composed primarily of stage 2 sleep and periods of REM sleep that can last as long as 40 minutes. In a later section, we'll look at dreaming and REM sleep in more detail.

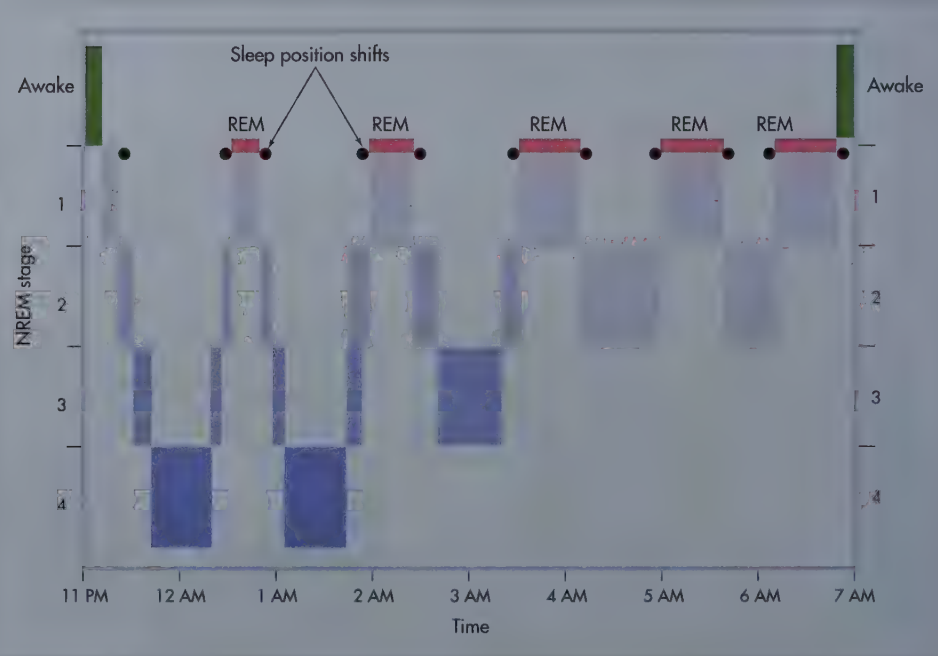


FIGURE 4.4 The 90-Minute Cycles of Sleep During a typical night, you experience five 90-minute cycles of alternating NREM and REM sleep. The deepest stages of NREM sleep, stages 3 and 4, occur during the first two 90-minute cycles. Dreaming REM sleep episodes become progressively longer as the night goes on. Shifts in sleep position, indicated by the dots, usually occur immediately before and after REM episodes.

Source: Based on Hobson (2004).

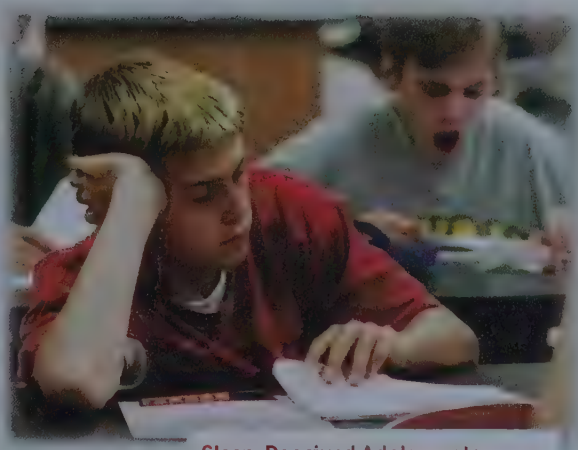
Changing Sleep Patterns Over the Lifespan

As any parent knows, sleep patterns change over the lifespan. Circadian rhythms seem to develop before birth. Consistent daily variations in movement, heart rate, and other variables are evident by the fifth month of prenatal development. During the third trimester of prenatal development, active (REM) and quiet (NREM) sleep cycles emerge. In the final weeks, REM and NREM sleep are clearly distinguishable in the fetus (Mirmiran & others, 2003).

The newborn sleeps about 16 hours a day, though not all at once. Up to 8 hours—or 50 percent—of the newborn's sleep time is spent in REM sleep. The rest is spent in quiet sleep that is very similar to NREM stages 1 and 2. It's not until about the third month of life that the deep, slow-wave sleep of NREM stages 3 and 4 appears.

The typical 90-minute sleep cycles gradually emerge over the first few years of life. The infant's sleep during the first months of life is characterized by shorter 60-minute sleep cycles, producing up to 13 sleep cycles per day. By age 2, the toddler is experiencing 75-minute sleep cycles. By age 5, the typical 90-minute sleep cycles of alternating REM and NREM sleep are established (Grigg-Damberger & others, 2007).

From childhood through late adulthood, the pattern of a typical night's sleep evolves and changes (see Figure 4.5). Total sleep time and the percentage of a night's sleep spent in deeper slow-wave sleep decrease. This is offset by gradual increases in the percentage of time spent each night in lighter NREM stages 1 and 2. The percentage of a night's sleep devoted to REM sleep increases during childhood and adolescence, remains stable throughout adulthood, and then decreases during late adulthood (Ohayon & others, 2004).



David Lassman/Syracuse Newspapers/The Image Works

Sleep-Deprived Adolescents
Circadian rhythms shift in adolescence. Adolescents tend to fall asleep later and wake up later. Few teenagers get the 8.5 to 9 hours of sleep that they need to feel fully rested. In the U.S., more than two-thirds of teenagers report that they get less than 7 hours of sleep on school nights, which is probably why they tend to sleep about 2 hours longer on weekends. Consequences of regular sleep loss include poor school performance, increased risk of accidents and injuries, and depressed mood (Colrain & Baker, 2011).

Why Do We Sleep?

It may seem obvious: we sleep because we're tired and need rest. It may surprise you to learn that sleep researchers aren't really sure *why* we sleep (Cirelli & Tononi, 2008). Clearly, sleep promotes physiological processes that restore and rejuvenate the body and the mind. Along with providing needed rest to muscles and body, sleep is thought to maintain immune system function, enhance learning and consolidate memory, improve brain function, and help regulate moods and emotion (Roth & others, 2010; Walker & Van der Helm, 2009).

However, this approach to explaining sleep doesn't account for the enormous variability in sleep patterns across different species. Some researchers take the view

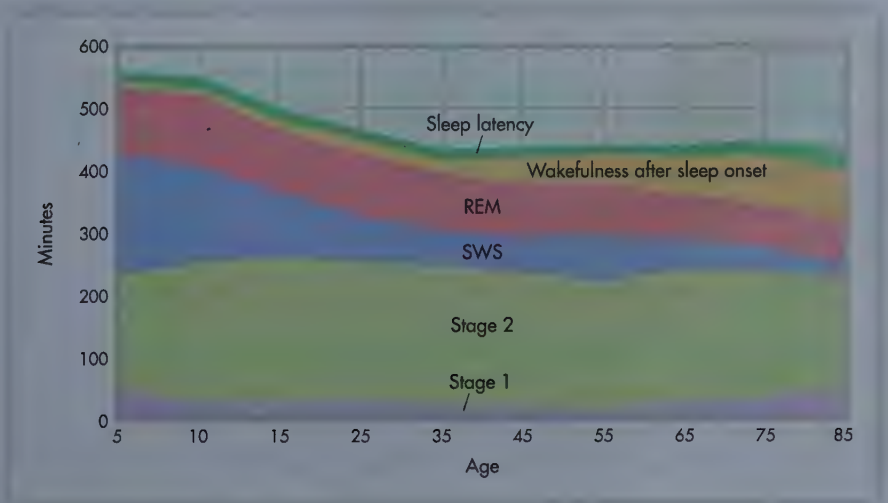


FIGURE 4.5 Sleep Over the Lifespan Sleep quality changes significantly over the lifespan. In particular, notice that slow-wave sleep decreases over the lifespan, as does total sleep time. By middle adulthood, people are more likely to experience *wakefulness after sleep onset*, abbreviated *WASO*. Senior adults aged 55 and older often take longer to fall asleep, which is technically called *sleep latency* (Bootzin & Epstein, 2011).

Question: When Does an 800-Pound Predator Sleep?
Answer: Any time it wants to! Sleep patterns vary widely across species. For example, sleep duration in mammals varies from a low of 3 hours a day in horses to up to 20 hours a day in bats (Siegel, 2005, 2009). One explanation is that sleep patterns result from evolutionary adaptation to a particular ecological niche. Thus, animals with few predators, like this polar bear, have the luxury of sleep long hours out in the open and even taking daytime naps after a meal. Hibernation patterns of animals such as bears and gophers also coincide with periods during which food is relatively scarce and environmental conditions pose the greatest threat to survival (Siegel, 2009).



Michio Hoshino/Minden Pictures

that the sleep patterns exhibited by different animals, including humans, are the result of *evolutionary adaptation* (Siegel, 2009; Roth & others, 2010). According to this view, different sleep patterns evolved as a way of conserving energy and preventing a particular species from interacting with the environment when doing so is most hazardous.

For example, animals with few natural predators, such as gorillas and lions, sleep as much as 15 hours a day. In contrast, grazing animals, such as cattle and horses, tend to sleep in short bursts that total only about 4 hours per day (Siegel, 2005). Lions, much like their evolutionary cousins, the domestic cat, sleep long and deeply, but giraffes, their prey, sleep very little. Similarly, hibernation patterns also reflect evolutionary adaptation, coinciding with periods during which food is relatively scarce and environmental conditions pose the greatest threat to survival.

Rather than an all-encompassing theory explaining why we sleep, today's sleep researchers recognize that sleep serves a host of vital functions. Studying sleep from multiple perspectives—psychological, physiological, and neurological—yields a dynamic understanding of how sleep occurs and is regulated, and how it contributes to optimal functioning (Datta & MacLean, 2007).

The Effects of Sleep Deprivation

The importance of sleep is demonstrated by *sleep deprivation studies.* After being deprived of sleep for just one night, research subjects develop *microsleeps,* which are episodes of sleep lasting only a few seconds that occur during wakefulness. People who go without sleep for a day or more also experience disruptions in mood, mental abilities, reaction time, perceptual skills, and complex motor skills (Bonnet, 2005).

But what about getting *less* than your usual amount of sleep? *Sleep restriction studies* reduce the amount of time that people are allowed to sleep to as little as four hours per night.

Sleep restriction produces numerous impairments and changes, not the least of which is an increased urge to sleep. Concentration, vigilance, reaction time, memory skills, and the ability to gauge risks are diminished. Motor skills—including driving skills—decrease, producing a greater risk of accidents. As discussed in the Focus on Neuroscience box titled "The Sleep-Deprived Emotional Brain," moods, especially negative moods, become much more volatile (Harvey, 2011). Harmful changes occur in hormone levels, including stress hormone levels (Balbo & others, 2010). The immune system's effectiveness is diminished, increasing susceptibility to colds and infections. Finally, metabolic changes occur, including changes linked to obesity and diabetes (Van Cauter & others, 2008).

If sleep restriction continues for multiple nights, all of these changes become more pronounced. Unfortunately most people are *not* good at judging the extent to which their performance is impaired by inadequate sleep. People tend to think they

REM rebound A phenomenon in which a person who is deprived of REM sleep greatly increases the amount of time spent in REM sleep at the first opportunity to sleep uninterrupted.

FOCUS ON NEUROSCIENCE

The Sleep-Deprived Emotional Brain

Whether they are children or adults, people often react with greater emotionality when they're not getting adequate sleep (Zohar & others, 2005). Is this because they're simply tired, or do the brain's emotional centers become more reactive in response to sleep deprivation?

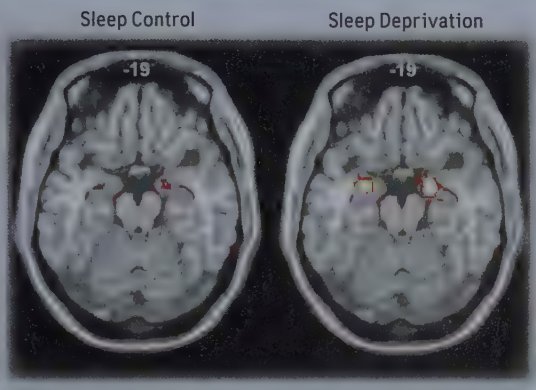
To study this question, researcher Seung-Schik Yoo and his colleagues (2007) deprived some participants of sleep for 35 hours while other participants slept normally. Then, all of the participants observed a series of images ranging from emotionally neutral to very unpleasant and disturbing images while undergoing an fMRI brain scan.

Compare the two fMRI scans shown here. The orange and yellow areas indicate the degree of activation in the *amygdala*, a key component of the brain's emotional centers. Compared to the adequately rested participants, the amygdala activated 60 percent more strongly when the sleep-deprived participants looked at the aversive images.

Yoo's research clearly shows that the sleep-deprived brain is much more prone to strong emotional reactions to negative stimuli. And, new research shows that sleep deprivation also affects how we respond to *positive* stimuli. The same team of researchers found that sleep-deprived participants responded with heightened activity in the brain's reward circuits to images of *pleasant* scenes, such as cute bunnies or ice cream sundaes (Gujar & others, 2011). The implication? Unrealistically positive responses may lead sleep-deprived people to engage in risky or addictive behavior.

As sleep scientist Matthew Walker (2011) observes, "When functioning correctly, the brain finds the sweet spot on the mood spectrum. But the sleep-deprived brain will swing to both extremes, neither of which is optimal for making wise decisions."

So, when you're consistently operating on too little sleep, monitor your emotional reactions so that you don't overreact and say or do something that you will regret later—such as after you've caught up on your sleep.



Reprinted from Yoo, Seung-Schik; Gujar, Ninad; Hu, Peter; Jolesz, Ferenc A.; & Walker, Matthew, P. (2007). The human emotional brain without sleep: A prefrontal-amygdala disconnect. *Current Biology*, 17, 877-878. Copyright 2007, with permission from Elsevier.

are performing adequately, but in fact, their abilities and reaction time are greatly diminished (Walker, 2008).

Sleep researchers have also selectively deprived people of different components of normal sleep. To study the effects of *REM deprivation*, researchers wake sleepers whenever the monitoring instruments indicate that they are entering REM sleep. After several nights of being selectively deprived of REM sleep, the subjects are allowed to sleep uninterrupted. What happens? They experience **REM rebound**—the amount of time spent in REM sleep increases by as much as 50 percent. Similarly, when people are selectively deprived of NREM stages 3 and 4, they experience *NREM rebound*, spending more time in NREM sleep (Borbély & Achermann, 2005; Tobler, 2005). Thus, it seems that the brain needs to experience the full range of sleep states, making up for missing sleep components when given the chance.

CONCEPT REVIEW 4.1

Circadian Rhythms and Stages of Sleep

Fill in the blanks with the missing terms.

1. Kevin participated in a sleep research study in which he spent two months in a laboratory isolated from sunlight and other natural light/dark cues. Eventually, his body clock drifted to a _____ hour daily cycle.
2. When Kevin left the sleep research study, his _____ was reset by exposure to _____, and his _____ returned to a normal 24-hour cycle.
3. You've been asleep for about 10 minutes and are experiencing brief bursts of brain activity, called *sleep spindles*. This means that you are in _____ sleep.
4. Compared to his 80-year-old grandfather, 7-year-old Vance spends more of each night in _____ sleep.
5. As a participant in a sleep study, the lab assistant wakes you and asks you to recite the alphabet backwards. You do so, but remember nothing about this event when asked the next morning. You were probably awakened during _____.



Dreams and Mental Activity During Sleep

KEY THEME

› A dream is an unfolding sequence of perceptions, thoughts, and emotions that is experienced as a series of actual events during sleep.

KEY QUESTIONS

› How does brain activity change during dreaming sleep, and how are those changes related to dream content?

› What roles do the different stages of sleep play in forming new memories?

› What do people dream about, and why don't we remember many of our dreams?

Dreams have fascinated people since the beginning of time. By adulthood, about 25 percent of a night's sleep, or almost two hours every night, is spent dreaming. So, assuming you live to a ripe old age, you'll devote more than 50,000 hours, or about six years of your life, to dreaming.

Although dreams may be the most interesting brain productions during sleep, they are not the most common. More prevalent is **sleep thinking,** also called *sleep mentation*. Sleep thinking usually occurs during NREM slow-wave sleep and consists of vague, bland, thoughtlike ruminations about real-life events (McCarley, 2007). Sleep thinking probably contributes to those times when you wake up with a solution to some vexing problem. But at other times, the ruminating thoughts of sleep thinking can interfere with your sleep. For example, on the night before an important exam, anxious students will sometimes toss and turn their way through the night as they mentally review terms and concepts during NREM sleep thinking.

In contrast to sleep thinking, a **dream** is an unfolding sequence of perceptions, thoughts, and emotions during sleep that is experienced as a series of real-life events (Domhoff, 2005). Granted, the storyline and details of those dream events may be illogical, even bizarre. But in the unique mental landscapes of our own internally generated reality, the bizarre and illogical are readily accepted as disbelief is suspended.

Most dreams happen during REM sleep, although dreams also occur during NREM (Domhoff, 2011). When awakened during active REM sleep, people report a dream about 90 percent of the time, even people who claim that they never dream. The dreamer is usually the main participant in these events, and at least one other person is involved in the dream story. But sometimes the dreamer is simply the observer of the unfolding dream story.



The Kobal Collection/Warner Bros

Dream Images The hit film *Inception*, starring Leonardo DiCaprio, used compelling dream sequences in its tale of corporate espionage accomplished by invading the dreams of unsuspecting competitors. People tend to emphasize visual imagery when describing their dreams, but sounds and physical sensations are also commonly present. Sensations of falling, flying, spinning, or trying to run may be experienced. We tend to dream of familiar people and places, but the juxtapositions of characters, objects, and events are often illogical, and sometimes bizarre (Nielsen & Stenstrom, 2005). Nevertheless, dreamers rarely question a dream's details—until they wake up!

FOCUS ON NEUROSCIENCE

The Dreaming Brain: Turning REM On and Off

Neuroscientists are making sense out of the fact that our dreams often don't make sense. Compared to the awake brain, or even the brain in NREM sleep, the dreaming brain undergoes distinct changes. About every 90 minutes, key brain areas are ramped up, scaled back, or blocked from sending or receiving input during REM sleep. Levels of certain neurotransmitters surge while other neurotransmitters recede. As the internal dynamics of the brain fluctuate, they are reflected in the psychological and emotional aspects of the dream itself (Fuller & others, 2006; Nofzinger, 2006; Pace-Schott, 2005).

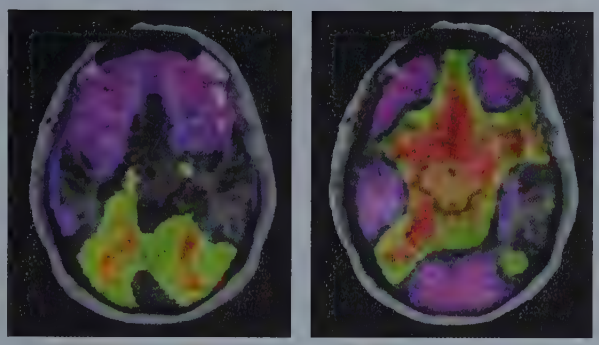
REM-Off and REM-On Neurons

Earlier, on page 144, Figure 4.4 depicted the 90-minute cycles of NREM and REM sleep over a typical night. Although the figure gives the impression of distinct shifts from one NREM stage to another, and from NREM to REM sleep, it's not quite like shifting gears. Instead, each 90-minute cycle of NREM and REM sleep reflects the gradually changing balance of REM-off and REM-on neuronal activity.

REM-off neurons produce the neurotransmitters *norepinephrine* and *serotonin*, which suppress REM sleep. In contrast, REM-on neurons produce the neurotransmitter *acetylcholine*, which promotes REM sleep. When the activity of REM-on neurons and acetylcholine levels reach a certain threshold, the characteristic signs of REM sleep emerge—increased brain activity, rapid eye movements, and suppressed voluntary muscle movements. As acetylcholine levels continue to rise, these REM-related characteristics intensify. When acetylcholine and REM activity peak, REM-off neuronal activity picks up, increasing serotonin and norepinephrine levels. Eventually, REM sleep is suppressed and the characteristic features of slow-wave NREM sleep reemerge—reduced brain and physiological activity, movement capabilities, and the vague, ruminating thoughts of sleep thinking (McCarley, 2007).

Adjusting the Brain for REM Sleep

PET scan and other neuroimaging studies have revealed how the brain's activity during REM sleep is distinctly different from its activity as compared to wakefulness (PET scan *a*) and NREM slow-wave sleep (PET scan *b*). To help orient you, the top of each PET scan corresponds to the front of the brain and the bottom to the back of the brain. The PET scans are color-coded: Bluish-purple indicates areas of decreased brain activity and yellow-red indicates areas of increased brain activity.



Courtesy of Dr. Allen R. Braun, Language Section, National Institute on Deafness and Other Communication Disorders, NIH

(a) REM sleep compared to wakefulness

(b) REM sleep compared to slow-wave sleep

Compared to wakefulness, PET scan (*a*) reveals that REM sleep involves decreased activity in the frontal lobes, which are involved in rational thinking. Also decreased is the activity of the primary visual cortex, which normally processes external visual stimuli. In effect, the dreamer is cut off from the reality-testing functions of the frontal lobes—a fact that no doubt contributes to the weirdness of some dreams. The yellow-red areas in PET scan (*a*) indicate increased activity in association areas of the visual cortex. This brain activation gives rise to the visual images occurring in a dream.

Compared to slow-wave sleep, the yellow-red areas in PET scan (*b*) indicate that REM sleep is characterized by a sharp increase in limbic system brain areas associated with emotion, motivation, and memory. The activation of limbic system brain areas reflects the dream's emotional qualities, which can sometimes be intense (Braun & others, 1998; Nofzinger, 2005b).

People usually have four or five dreaming episodes each night. The first REM episode of the night is the shortest, lasting only about 10 minutes. Subsequent REM episodes average around 30 minutes and tend to get longer as the night continues. Early morning dreams, which can last 40 minutes or longer, are the dreams most likely to be recalled.

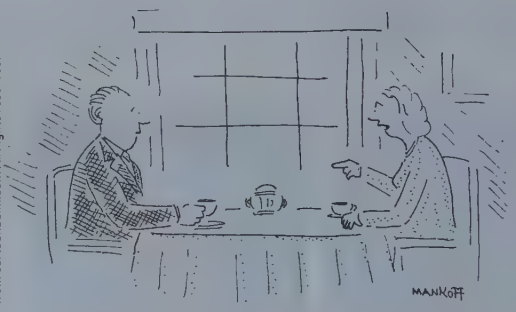
PET (positive-emission tomography) and fMRI scans have revealed that the brain's activity during REM sleep is distinctly different from its activity during either wakefulness or NREM slow-wave sleep (Fuller & others, 2006; Nofzinger, 2006). These differences and the roles they play in dream content are explored in the Focus on Neuroscience box titled "The Dreaming Brain: Turning REM On and Off."

sleep thinking Vague, bland, thoughtlike ruminations about real-life events that typically occur during NREM sleep; also called *sleep mentation*.

dream An unfolding sequence of thoughts, perceptions, and emotions that typically occurs during REM sleep and is experienced as a series of real-life events.

Sleep and Memory Formation: Let Me Sleep on It!

Sleep plays a critical role in strengthening new memories and in integrating new memories with existing memories (Walker, 2009, 2010). Interestingly, different sleep states and stages seem to contribute to forming different kinds of memories.


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"Look, don't try to weasel out of this. It was my dream, but you had the affair in it."

For example, research suggests that NREM slow-wave sleep contributes to forming new *episodic memories,* which are memories of personally experienced events (Diekelmann & Born, 2010). In contrast, REM sleep and NREM stage 2 sleep seem to help consolidate new *procedural memories,* which involve learning a new skill or task until it can be performed automatically (Stickgold & Walker, 2007).

Sleep researchers are finding that the strengthening and enhancement of new memories during sleep is a very active process. That active process seems to work like this: New memories formed during the day are *reactivated* during the 90-minute cycles of sleep that occur throughout the night. This process of repeatedly reactivating these newly encoded memories during sleep strengthens the neuronal connections that contribute to forming long-term memories (Wamsley & others, 2010). But along with helping solidify new memories, sleep is also critical to integrating the new memories into existing networks of memories (Rasch & Born, 2008; Walker, 2010).

Dream Themes and Imagery

The Golden Horse in the Clouds

The popular stereotype is that very weird and highly emotional dreams are the norm. Granted, almost everyone can remember having had a really bizarre, rapidly shifting dream at some time or another. But research on dream content shows that bizarre dream stories tend to be the exception, not the rule. As psychologist and dream researcher William Domhoff (2007) points out, dreams tend be "far more coherent, patterned, and thoughtful than is suggested by the usual image of them." Although some dreams are bizarre, *most* dreams are about everyday settings, people, activities, and events.

What about unlikely or impossible events that are supposedly very common themes, such as dreaming that you are naked in a public place, flying through the air under your own power, wandering around lost, or tumbling through space? Common student dream themes supposedly include failing an exam or being completely unprepared in class. Are such dream themes really that common?

Apparently not. In reviewing studies of dream content, Domhoff (2005, 2010) has concluded that so-called common dream themes are actually quite rare in dream reports. Although dream story details may be original in that the events have never actually happened, the details usually aren't fantastic (e.g., being naked in public) or completely off the wall (e.g., flying through the air). And, dream emotions are usually appropriate in the context of the dream story (Domhoff, 2011).

So what patterns and themes are typical? Here are some of the well-substantiated findings on common dream content (Domhoff, 2007, 2011):

- Women report males and females in equal proportion as other dream story characters.
- Men are more likely to report other males as the dream story characters.
- Negative feelings and events are more common than positive ones.
- Instances of aggression are more common than are instances of friendliness.
- Dreamers are more likely to be victims of aggression than aggressors in their dreams.
- Men are much more likely than women to report dreams involving physical aggression.
- Women are more likely than men to report emotions in their dreams.
- Sex or sexual behaviors seldom occur as elements of the dream story.
- Apprehension or fear is the most frequently reported dream emotion for both sexes, followed by happiness and confusion.


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"Off with his head! Off with his head!"

If apprehensive or fearful emotions become progressively more intense as a dream story unfolds, the person may experience a nightmare. A **nightmare** is a vivid and disturbing dream that often awakens the sleeper. Typically, the dreamer feels helpless or powerless in the face of being aggressively attacked or pursued. Although fear, anxiety, and even terror are the most commonly experienced emotions, some nightmares involve intense feelings of sadness, anger, disgust, or embarrassment (Nielsen & Zadra, 2005). Sometimes, the disturbing and emotionally charged dream imagery causes the person to jolt awake.

Nightmares occur most commonly during middle and late childhood, then decrease in frequency during adolescence and young adulthood. However, about 5 to 10 percent of adults experience nightmares on a weekly basis.

Women report more frequent nightmares than men. Daytime stress, anxiety, and emotional difficulties are often associated with nightmares. As a general rule, nightmares are not indicative of a psychological or sleep disorder unless they occur frequently, cause difficulties returning to sleep, or cause daytime distress (Levin & Nielsen, 2007; Nielsen & others, 2006).

nightmare A vivid and frightening or unpleasant anxiety dream that occurs during REM sleep.

manifest content In Freud's psychoanalytic theory, the elements of a dream that are consciously experienced and remembered by the dreamer.

latent content In Freud's psychoanalytic theory, the unconscious wishes, thoughts, and urges that are concealed in the manifest content of a dream.

The Significance of Dreams

KEY THEME

› The notion that dream images contain symbolic messages has been challenged by contemporary neuroscience studies of the dreaming brain.

KEY QUESTIONS

› How did Freud explain dreams?

› How do the activation–synthesis and neurocognitive models explain dreams?

› What general conclusions can be drawn about the nature of dreams?

For thousands of years and throughout many cultures, dreams have been thought to contain highly significant, cryptic messages. Do dreams mean anything? Do they contain symbolic or hidden messages? In this section, we will look at two theories that try to account for the purpose of dreaming, starting with the most famous one.

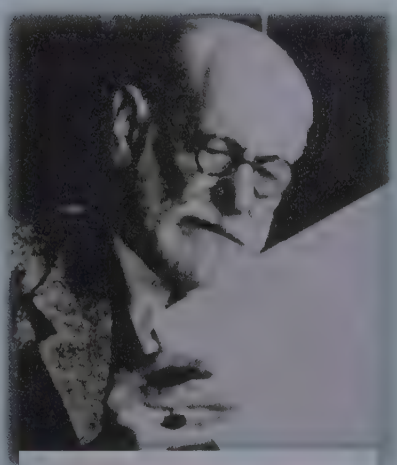
Sigmund Freud

Dreams as Fulfilled Wishes

In the chapters on personality and therapies (Chapters 11 and 15), we'll look in detail at the ideas of **Sigmund Freud,** the founder of psychoanalysis. As we discussed in Chapter 1, Freud believed that sexual and aggressive instincts are the motivating forces that dictate human behavior. Because these instinctual urges are so consciously unacceptable, sexual and aggressive thoughts, feelings, and wishes are pushed into the unconscious, or *repressed.* However, Freud believed that these repressed urges and wishes could surface in dream imagery.

In his landmark work, *The Interpretation of Dreams* (1900), Freud wrote that dreams are the "disguised fulfillments of repressed wishes" and provide "the royal road to a knowledge of the unconscious mind." In fact, he contended that "wish-fulfillment is the meaning of each and every dream." According to Freud, then, dreams function as a sort of psychological "safety valve" for the release of unconscious and unacceptable urges (see Yu, 2011).

Freud (1904) believed that dreams have two components: the **manifest content,** or the dream images themselves, and the **latent content,** the disguised psychological meaning of the dream. For example, Freud (1911) believed that dream images of sticks, swords, brooms, and other elongated objects were *phallic symbols,* representing the penis. Dream images of cupboards, boxes, and ovens supposedly symbolized the vagina.



AKG/Photoresearchers

Freud on the Meaning of Dreams
Dream interpretation played an important role in Sigmund Freud's famous form of psychotherapy, called *psychoanalysis.* Freud believed that because psychological defenses are reduced during sleep, frustrated sexual and aggressive wishes are expressed symbolically in dreams. "In every dream an instinctual wish has to be represented as fulfilled," Freud (1933) wrote.

IN FOCUS

What You Really Want to Know About Dreams



Bizzarro (new) ©Dan Piedro.King Features Syndicate

If I fall off a cliff in my dreams and don't wake up before I hit the bottom, will I die?

The first obvious problem with this bit of folklore is that if you did die before you woke up, how would anyone know what you'd been dreaming about? Beyond this basic contradiction, studies have shown that about a third of dreamers can recall a dream in which they died or were killed.

Do animals dream?

Virtually all mammals and birds experience sleep cycles in which REM sleep alternates with slow-wave NREM sleep. Animals clearly demonstrate perception and memory. They also communicate using vocalizations, facial expressions, posture, and gestures to show territoriality and sexual receptiveness. Thus, it's quite reasonable to conclude that the brain and other physiological changes that occur during animal REM sleep are coupled with mental images.

What do blind people "see" when they dream?

People who become totally blind before the age of 5 typically do not have visual dreams as adults. Even so, their dreams are just as complex and vivid as sighted people's dreams; they just involve other sensations—of sound, taste, smell, and touch.

Is it possible to control your dreams?

Yes, if you have lucid dreams. A *lucid dream* is one in which you become aware that you are dreaming while you are still asleep. About half of all people can recall at least one lucid dream, and some people frequently have lucid dreams. The dreamer can often consciously guide the course of a lucid dream, including backing it up and making it go in a different direction.

Can you predict the future with your dreams?

History is filled with stories of dream prophecies. Over the course of your life, you will have over 100,000 dreams. Simply by chance, it's not surprising that every now and then a dream contains elements that coincide with future events.

Are dreams in color or black and white?

Up to 80 percent of our dreams contain color. When dreamers are awakened and asked to match dream colors to standard color charts, soft pastel colors are frequently chosen.

Sources: Empson (2002); Hobson & Voss (2010); Hurovitz & others (1999); Ross & others (2010); Voss & others (2009).

In some types of psychotherapy today, especially those that follow Freud's ideas, dreams are still seen as an important source of information about psychological conflicts (Auld & others, 2005; Pesant & Zadra, 2004). However, Freud's belief that dreams represent the fulfillment of repressed wishes has not been substantiated by psychological research. Furthermore, research does not support Freud's belief that the dream images themselves—the manifest content of dreams—are symbols that disguise the dream's true psychological meaning (Domhoff, 2003, 2011).

Both emotional salience and the cognitive mishmash of dreams are the undisguised read-out of the dreaming brain's unique chemistry and physiology. This doesn't mean that dreams make no psychological sense. On the contrary, dreams are dripping with emotional salience. Dreams can and should be discussed for their informative messages about the emotional concerns of the dreamer.

J. Allan Hobson (1999)

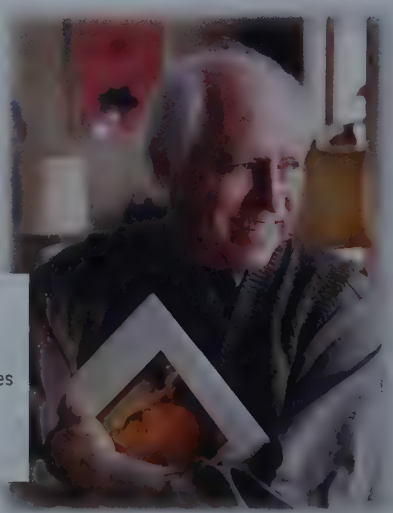


Photo by Graham Gordon Ramsay

Dream Researcher J. Allan Hobson
Neuroscientist J. Allan Hobson developed the activation–synthesis model of dreaming with his colleague Robert McCarley. Although Hobson believes that dreams are the by-products of physiological processes in the brain, he does not believe that dreams are meaningless.

The Activation–Synthesis Model of Dreaming

Researchers **J. Allan Hobson** and **Robert McCarley** first proposed a new model of dreaming in 1977. Called the **activation–synthesis model of dreaming,** this model maintains that dreaming is our subjective awareness of the brain's internally generated signals during sleep. Since it was first proposed, the model has evolved as new findings have been reported (see McCarley, 2007; Pace-Schott, 2005).

Specifically, the activation–synthesis model maintains that the experience of dreaming sleep is due to the automatic activation of brainstem circuits at the base of the brain (see Figure 4.6). These circuits

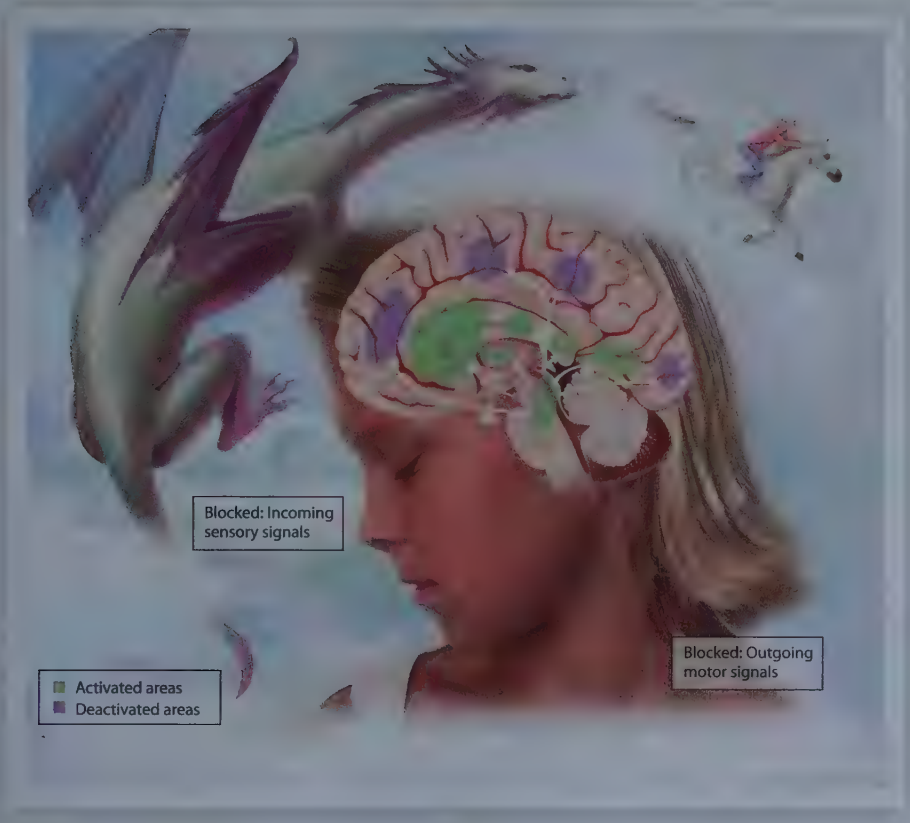


FIGURE 4.6 The Activation–Synthesis Model of Dreaming According to the activation–synthesis model of dreaming, dreaming is our subjective awareness of the brain's internally generated signals during sleep. Dreaming is initiated when brainstem circuits arouse brain areas involved in emotions, memories, movements, and sensations. These activated brain areas, shown in green, give rise to dreaming consciousness and the dream imaginations of sensations, perceptions, movements, and feelings. The activated brain synthesizes, or combines, these elements, drawing on previous experiences and memories to impose a personal meaning on the dream story (Hobson, 2005; McCarley, 2007).

Other brain areas, highlighted in purple, are deactivated or blocked during dreaming. Outgoing motor signals and incoming sensory signals are blocked, keeping the dreamer from acting out the dream or responding to external stimuli (Pace-Schott, 2005). The logical, rational, and planning functions of the prefrontal cortex are suspended. Hence, dream stories can evolve in ways that seem disjointed or illogical. And because the prefrontal cortex is involved in processing memories, most nightly dream productions evaporate with no lingering memories of having had these experiences (Muzur & others, 2002).

Sources: Adapted from Hobson (2005); Pace-Schott (2005).

arouse more sophisticated brain areas, including visual, auditory, and motor pathways. As noted earlier in the Focus on Neuroscience box "The Dreaming Brain," limbic system structures involved in emotion, such as the amygdala and hippocampus, are activated during REM sleep. When we're awake, these brain structures and pathways are involved in registering stimuli from the external world. But rather than responding to stimulation from the external environment, the dreaming brain is responding to its own internally generated signals (Hobson, 2005).

In the absence of external sensory input, the activated brain combines, or synthesizes, these internally generated sensory signals and imposes meaning on them. The dream story itself is derived from a hodgepodge of memories, emotions, and sensations that are triggered by the brain's activation and chemical changes during sleep. According to this model, then, dreaming is essentially the brain synthesizing and integrating memory fragments, emotions, and sensations that are internally triggered (Hobson & others, 1998; Hobson & others, 2011).

The activation–synthesis theory does *not* contend that dreams are completely meaningless. But if there is a meaning to dreams, that meaning lies in the deeply personal way in which the images are organized, or synthesized. In other words, the meaning is to be found not by decoding the dream symbols, but by analyzing the way the dreamer makes sense of the progression of chaotic dream images.

The Neurocognitive Theory of Dreaming

In contrast to the activation–synthesis model, the **neurocognitive model of dreaming** emphasizes the *continuity between waking and dreaming cognition*. According to William Domhoff (2005, 2010, 2011), dreams are not a "cognitive mishmash" of random fragments of memories, images, and emotions generated by lower brainstem circuits, as the activation–synthesis model holds. Rather, research shows that dreams reflect our interests, personality, and individual worries (Nir & Tononi, 2010).

activation–synthesis model of dreaming The theory that brain activity during sleep produces dream images (*activation*), which are combined by the brain into a dream story (*synthesis*).

neurocognitive model of dreaming Model of dreaming that emphasizes the continuity of waking and dreaming cognition, and states that dreaming is like thinking under conditions of reduced sensory input and the absence of voluntary control.

sleep disorders Serious and consistent sleep disturbances that interfere with daytime functioning and cause subjective distress.

dyssomnias (dis-SOM-nee-uz) A category of sleep disorders involving disruptions in the amount, quality, or timing of sleep; includes insomnia, obstructive sleep apnea, and narcolepsy.

parasomnias (pare-uh-SOM-nee-uz) A category of sleep disorders characterized by arousal or activation during sleep or sleep transitions; includes *sleepwalking, sleep terrors, sleepsex, sleep-related eating disorder,* and *REM sleep behavior disorder.*

insomnia A condition in which a person regularly experiences an inability to fall asleep, to stay asleep, or to feel adequately rested by sleep.

obstructive sleep apnea (APP-nee-uh) A sleep disorder in which the person repeatedly stops breathing during sleep.

Further, the activation–synthesis model rests on the assumption that dreams result from brain activation during REM sleep. However, Domhoff and other dream researchers point out, people also dream during NREM sleep, at sleep onset, and even experience dreamlike episodes while awake but drowsy (Nir & Tononi, 2010).

According to the neurocognitive model, the special characteristics of dreams are due to two conditions that occur during sleep. First, we are cut off from external sensory stimuli, so we generate our own sensory data. And second, we're unable to control our thought processes. Under these two conditions, "thoughts" take the shape of dreams.

Domhoff (2011) also points out that waking thought can also be marked by spontaneous mental images, rapid shifts of scene or topic, and unrealistic or fanciful thoughts (see Domhoff, 2011). Thus, dreams are not as foreign to our waking experience as the activation–synthesis model claims.

Dreams, William Domhoff (2010) observes, "are like plays that the mind stages for itself when it doesn't have anything specific to do." Dreams mirror our waking concerns, and do so in a way that is remarkably similar to normal thought processes.



Sleep Disorders

KEY THEME

› Sleep disorders are surprisingly common, take many different forms, and interfere with a person's daytime functioning.

KEY QUESTIONS

› How do the two broad categories of sleep disorders differ?

› Which sleep disorders are characterized by excessive daytime sleepiness?

› What kinds of behavior are displayed in the different parasomnias?

Data from the National Sleep Foundation's annual polls indicate that about 7 out of 10 people experience regular sleep disruptions. Such disruptions become a **sleep disorder** when (a) abnormal sleep patterns consistently occur, (b) they cause subjective distress, and (c) they interfere with a person's daytime functioning (Thorpy, 2005a; Thorpy & Plazzi, 2010).

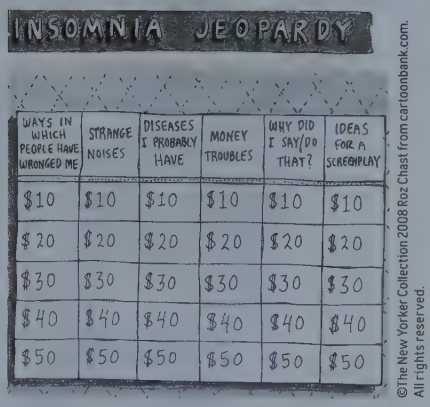
In this section, you'll see how those complaints are magnified in different sleep disorders, which fall into two broad categories. First, we'll consider **dyssomnias,** which are sleep disorders involving disruptions in the amount, quality, or timing of sleep. Insomnia, obstructive sleep apnea, and narcolepsy are examples of dyssomnias. Then we'll consider the **parasomnias,** which are sleep disorders involving undesirable physical arousal, behaviors, or events during sleep or sleep transitions.



The Perils of Driving While Drowsy According to studies reported by the National Highway Traffic Safety Administration (2003), drowsiness is blamed for at least 100,000 traffic accidents each year, causing more than 70,000 injuries—and 1,500 deaths. While many people in the United States get by with too little sleep, one group is especially prone to the effects of sleepiness behind the wheel—adult males age 25 or younger. Young male drivers have the highest number of traffic accidents that can be attributed to drowsiness (National Sleep Foundation, 2000).

ADSI/Alamy

Insomnia



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Insomnia is not defined solely based on how long a person sleeps because people vary in how much sleep they need to feel refreshed. Rather, people are said to experience **insomnia** when they repeatedly (a) complain about the quality or duration of their sleep, (b) have difficulty going to sleep or staying asleep, or (c) wake before it is time to get up. In terms of going to sleep, regularly taking 30 minutes or longer to fall asleep is considered a symptom of insomnia. These disruptions produce daytime sleepiness, fatigue, impaired social or occupational performance, or mood disturbances (Bootzin & Epstein, 2011).

Insomnia is the most common sleep complaint among adults. Although estimates vary, about 1 out of 3 people occasionally experience *transient insomnia* lasting from one or two nights to a couple of weeks. About 1 out of 10 adults experience *chronic insomnia* at least three nights each week for a month or longer (Mahowald & Schenck, 2005; National Sleep Foundation, 2005).

The risk of insomnia is influenced by gender and age. Women are twice as likely to suffer from insomnia as men. Pregnancy can disrupt sleep, as can social factors, like unemployment or divorce. Insomnia also tends to increase with age. In older women who are approaching menopause, hot flashes and night sweats can often disturb sleep (Edinger & Means, 2005; National Sleep Foundation, 2006).

Often, hyperarousal interferes with the ability to fall asleep or stay asleep. The use of stimulants, such as caffeine or nicotine, can disrupt sleep, as can excitement or anticipation of an event. And of course, environmental factors like noise, excessive heat or cold, or simply being in unfamiliar surroundings, can cause sleep problems.

Most commonly, insomnia can be traced to anxiety over stressful life events, such as job or school difficulties, troubled relationships, the illness or death of a loved one, or financial problems. As the person worries and ruminates, anxiety intensifies, disrupting the ability to go to sleep or stay asleep. After a few nights of fragmented sleep, concerns about sleeping become an additional source of anxiety, and the person becomes hypersensitive to his sleeping difficulties. Now, a self-perpetuating *vicious circle* develops—concerns about the inability to sleep make disrupted sleep even more likely, further intensifying anxiety and worry over personal difficulties, producing more sleep difficulties, and so on (Perlis & others, 2005).

Although many causes can initially trigger insomnia, psychological and behavioral factors are almost always involved in perpetuating the problem. Fortunately, there are effective evidence-based psychological and behavioral treatments. In Enhancing Well-Being with Psychology, at the end of the chapter, we'll describe one effective behavioral treatment for insomnia and give you several suggestions to improve the quality of your sleep.

Obstructive Sleep Apnea

Blocked Breathing During Sleep

Excessive daytime sleepiness is a key symptom of the second most common sleep disorder. In **obstructive sleep apnea (OSA),** the sleeper's airway becomes narrowed or blocked, causing very shallow breathing or repeated pauses in breathing. Each time breathing stops, oxygen blood levels decrease and carbon dioxide blood levels increase. In response to these internal warning signals, the brain triggers a momentary awakening. Over the course of a night, 300 or more sleep apnea episodes can occur (Schwab & others, 2005).

Obstructive sleep apnea disrupts the quality and quantity of a person's sleep, causing daytime grogginess, poor concentration, memory and learning problems, and irritability (Weaver & George, 2005). Although OSA can occur in any age group, including small children, it becomes more common as people age. It is also more common in men than women.

Sleep apnea can often be treated with lifestyle changes, such as avoiding alcohol or losing weight (Hoffstein, 2005; Powell & others, 2005). Moderate to severe cases of sleep apnea are usually treated with *continuous positive airway pressure* (CPAP) (Grunstein, 2005).



An Episode of Cataplexy in Narcolepsy In this sequence of images, a man with narcolepsy experiences one of its most dramatic symptoms—cataplexy. Cataplexy involves the sudden and complete loss of muscle tone, and it is typically triggered by laughter, embarrassment, or some other type of emotional arousal. Although unable to move, the person remains conscious and aware of what is going on around him.

Joel Deutsch/Slim Films

Narcolepsy

Blurring the Boundaries Between Sleep and Wakefulness

Even with adequate nighttime sleep, people with **narcolepsy** experience overwhelming bouts of excessive daytime sleepiness and brief, uncontrollable episodes of sleep. These involuntary sleep episodes, called *sleep attacks* or *microsleeps*, typically last from a few seconds to several minutes.

During a microsleep, people can display *automatic behavior* and continue performing a routine behavior, such as writing or driving. But as you might suspect, task performance is impaired. Handwriting becomes illegible. This automatic behavior is very similar to the movement capabilities that can occur during normal NREM sleep at night.

Most people with narcolepsy—about 70 percent—experience regular episodes of cataplexy. Much like the suppression of voluntary muscle movements that occurs during normal REM sleep, **cataplexy** is the sudden loss of voluntary muscle strength and control, lasting from several seconds to several minutes. Usually triggered by a sudden, intense emotion, such as laughter, anger, fear, or surprise, mild cataplectic episodes might not even be noticed by others. Facial muscles momentarily sag, head or eyelids droop.

In more severe episodes of cataplexy, the person may completely lose muscle control, knees buckling as he or she collapses. Although unable to move or speak, the person is conscious and aware of what is happening.

Narcolepsy is considered a lifelong, chronic condition. The onset of narcolepsy can occur at any age. Although genetics may play a role—about 10 percent of people with narcolepsy have a relative with the same symptoms—most people with the disorder have no family history of narcolepsy.

Research points to multiple factors in the development of narcolepsy, including chromosomal, brain, neurotransmitter, and immune system abnormalities. Of note is the recent scientific discovery of a special class of neurotransmitters called **hypocretins** (De la Herrán-Arita & others, 2011). Also called *orexins*, hypocretins are produced exclusively by neurons in the *hypothalamus*. These hypothalamus neurons actively produce hypocretins during the daytime to maintain a steady state of wakefulness. When measured in spinal fluid, people with narcolepsy have very low or nonexistent hypocretin levels. Autopsies of people who had narcolepsy have revealed greatly reduced numbers of hypocretin-producing neurons in their brains (Datta & MacLean, 2007; Ohno & Sakurai, 2008).

The Parasomnias

Undesired Arousal or Actions During Sleep

We tend to think of sleep as an "either/or" phenomenon—we are either asleep or we are awake. But as the *parasomnias* show, sometimes sleep and waking states overlap or "bleed" into one another (Colwell, 2011; Mahowald & Schenk, 2005). And, while some parts of the brain, such as those involved in judging, thinking, or forming new memories are asleep, other, more primitive parts of the brain may become activated (Cartwright, 2010).

The parasomnias are a collection of sleep disorders that are characterized by undesirable physical arousal, behaviors, or events during sleep or sleep transitions (Mahowald & Schenk, 2005; Schenck, 2007). Whether involving very simple or very complex behaviors, all of the parasomnias involve some mixture of sleep and waking arousal or behavior. In the parasomnias, the brain is *partially* awake—awake enough to carry out the actions, but not awake enough to be consciously aware of performing the actions (Cartwright, 2010). Thus, a key characteristic of all of the parasomnias is lack of awareness while performing the actions and total amnesia for the behaviors or events upon awakening. Other characteristics of the parasomnias are that they:

- Arise during the NREM stages 3 and 4 slow-wave sleep that occurs in the first half of the night.
- Are more common in children and decrease with age.

narcolepsy (NAR-ko-lep-see) A sleep disorder characterized by excessive daytime sleepiness and brief lapses into sleep throughout the day.

cataplexy A sudden loss of voluntary muscle strength and control that is usually triggered by an intense emotion.

hypocretins A special class of neurotransmitters produced during the daytime to maintain a steady state of wakefulness; also called *orexins*.

- Occur in multiple family or extended family members, suggesting a genetic predisposition or susceptibility.
- Can be triggered by wide-ranging stimuli, including sleep deprivation, stress, erratic sleep schedules, sleeping medications, stimulants, pregnancy, and tranquilizers.

sleep terrors A sleep disturbance characterized by an episode of increased physiological arousal, intense fear and panic, frightening hallucinations, and no recall of the episode the next morning; typically occurs during stage 3 or stage 4 NREM sleep; also called *night terrors*.

sleepsex A sleep disorder involving abnormal sexual behaviors and experiences during sleep; also called *sexsomnia*.

sleepwalking A sleep disturbance characterized by an episode of walking or performing other actions during stage 3 or stage 4 NREM sleep; also called *somnambulism*.

sleep-related eating disorder (SRED) A sleep disorder in which the sleeper will sleepwalk and eat compulsively.

Sleep Terrors

Also called *night terrors*, **sleep terrors** typically occur in the first few hours of sleep during stage 3 or 4 NREM sleep. Physiologically, the first sign of a sleep terror is sharply increased physiological arousal—restlessness, sweating, and a racing heart. The person abruptly sits up in bed and may let out a panic-stricken scream or cry for help. To anyone who investigates, the person appears to be awake, thrashing in bed, terrified, and disoriented.

Whereas a *nightmare* involves a progressive unpleasant dream story, a sleep terror is usually accompanied by a single but terrifying sensation, such as being crushed, choking, or falling. The person may imagine that she is being smothered or that a threatening figure is present, such as an animal or monster. It's usually impossible to calm the person, although she may appear to be awake (Mahowald & Schenck, 2005).

Sleep terrors are dramatic but tend to be brief, usually lasting for a minute or less. As the episode passes, the person drops back to quiet sleep and wakes in the morning with no recollection of the incident.

Sleep terrors are more common in children than adults. For most children who experience sleep terrors, the episodes subside and stop during adolescence. Nonetheless, approximately 4 to 5 percent of adults experience sleep terrors (Mahowald & Bornemann, 2005).

Sleepsex

Also called *sexsomnia*, **sleepsex** involves abnormal sexual behaviors and experiences during sleep. Without realizing what they are doing, sleepers initiate some kind of sexual behavior, such as masturbation, groping or fondling their bed partner's genitals, or even sexual intercourse (Trajanovic & Shapiro, 2010). Although sometimes described as loving or playful, more often sleepsex behavior is characterized as "robotic," aggressive, and impersonal. Whether affectionate or forceful, the person's sleepsex behavior is usually depicted as being out of character with the individual's sexual behavior when awake (Schenck & others, 2007). As is the case in other parasomnias, the person typically has no memory of his or her actions the next day (Schenck, 2007).

Sleepwalking Sleepwalking is fairly common in children. Approximately 1 percent of preschoolers and 2 percent of school-aged children walk in their sleep at least a few nights per week (National Sleep Foundation, 2004). More generally, about 15 percent of all children have had at least one sleepwalking episode. Researchers used to believe that children outgrew their tendency to sleepwalk by late adolescence. However, sleepwalking in adulthood is much more common than once thought. It's now known that about 4 percent of adults are sleepwalkers (Hughes, 2007).

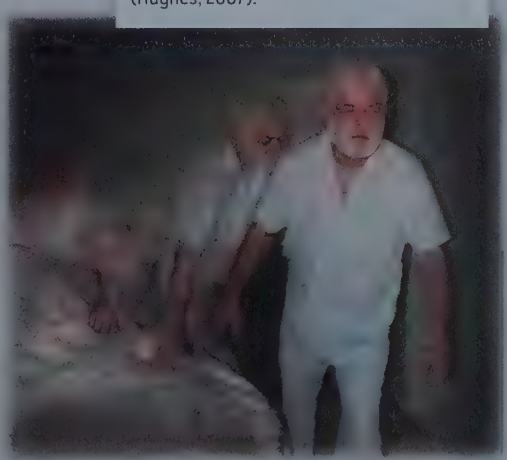
Sleepwalking and Sleep-Related Eating Disorder

The Prologue story about Scott described several key features of another parasomnia—**sleepwalking,** or *somnambulism*. Although the behavior of most sleepwalkers is pretty benign, some, like Scott, can react aggressively if touched or interrupted (Cartwright, 2004, 2007, 2010; Pressman, 2007). Surprisingly, a sleepwalker can engage in elaborate and complicated behaviors, such as unlocking locks, opening windows, dismantling equipment, using tools, and even driving.

Approximately 15 percent of all children have had at least one sleepwalking episode. A commonly believed notion is that sleepwalking disappears by adulthood. Although the prevalence does decrease, about 4 percent of adults are sleepwalkers, making it much more common in adulthood than is generally believed.

Sleepwalking nightly to the kitchen, eating compulsively, and then awakening the next morning with no memory of having done so are the hallmarks of **sleep-related eating disorder.** SRED affects at least 1 percent of Americans, or about 3 to 4 million people. Females are more than twice as likely as males to sleep-eat.

Although sweet-tasting foods like candy or cake are most commonly consumed, the sleepwalker can also voraciously eat bizarre items, like raw



Carol and Mike Werner/Phototake

Warning: May Cause Sleep-Driving and Sleep-Eating As the most widely prescribed sleeping pill in the United States, *Ambien®* was originally marketed as being safer, less addictive, and having fewer side effects than previous sleeping medications. But Ambien and similar sleeping pills turned out to have their own side effects. Ambien users have reported waking up to find the oven turned on and food strewn around the kitchen and in their bed. Other Ambien users have reported driving while asleep, waking up only after being arrested on the side of the road (Saul, 2007a, 2007b). The U.S. Food and Drug Administration now requires that Ambien and other sleeping medications warn of sleep-driving, sleep-eating, and performing other complex behaviors during sleep as potential side-effects.



Creative Ventures Unlimited

bacon, dry pancake mix, salt sandwiches, coffee grounds, or cat food sandwiches. Interestingly, alcoholic beverages are hardly ever consumed during an episode.

SRED poses potential dangers to the sleepwalker, including burns and injuries from cooking utensils, not to mention unexplained weight gain (Schenck, 2007).

REM Sleep Behavior Disorder (RBD)

The parasomnias described thus far emerge during NREM stages 3 and 4 slow-wave sleep. In contrast, **REM sleep behavior disorder (RBD)** represents a failure of the brain mechanisms that normally suppress voluntary actions during REM sleep. As a result, the person verbally and physically responds to the unfolding dream story, which they remember in vivid detail upon awakening.

The enacted dream story usually revolves around intense fear in response to being threatened or attacked by unfamiliar people or animals. In the dream, the person defensively fights back or tries to escape (Schenck & Mahowald, 2002). Because the brain fails to suppress voluntary actions, the person may punch, kick, yell, swear, gesture, jump out of bed, crouch, crawl on the floor, or run. In the process, they may pummel, grab, or choke their bed partner, charge full force into bedroom furniture, or crash through a window. Serious physical injuries to the dreamer or partner may require medical attention, which is often how RBD is first diagnosed (Mahowald & Schenck, 2005).

Although it can occur at any age, REM sleep behavior disorder typically occurs in males over the age of 60. Once it emerges, RBD is a chronic condition that gets progressively worse. Chronic REM sleep behavior disorder may be an early symptom of an underlying neurological disorder, such as Parkinson's disease or Alzheimer's disease (Abad & Guilleminault, 2004; Mahowald & Schenck, 2005). Temporary episodes of RBD can be triggered by antidepressant medications, excessive caffeine use, or alcohol withdrawal.

For more information about sleep disorders, visit the American Academy of Sleep Medicine's Web site, www.SleepEducation.com, or the National Sleep Foundation's Web site, www.SleepFoundation.org.

CONCEPT REVIEW 4.2

Sleep Disorders and Dreams

1. Lisa suddenly sat up in bed and started screaming and struggling with the blankets. Although her eyes were open, she didn't seem aware of her surroundings. After a few minutes, she fell back asleep. In the morning she remembered nothing of the incident. Lisa was probably in _____ sleep and experiencing a _____.
   a. stage 4 NREM; sleep terror
   b. stage 1 NREM; hypnagogic hallucination
   c. REM; nightmare
   d. REM; sleep terror

2. Mrs. Johnson is unable to sleep because her husband snores so loudly. He snorts as though he is gulping for air throughout the night, especially when he sleeps on his back. During the day Mr. Johnson is constantly tired. Mr. Johnson is probably suffering from _____.
   a. insomnia
   b. REM sleep behavior disorder
   c. narcolepsy
   d. obstructive sleep apnea (OSA)

3. The night before an important job interview, Marjorie doesn't sleep well. Each time she briefly awakens, the vague, thoughtlike imagery filling her mind is that of rehearsing details she wants to remember to say during the interview. These ruminations during sleep represent _____.
   a. dreams
   b. nightmares
   c. parasomnias
   d. sleep thinking

4. During psychotherapy sessions, Jake's therapist asks him to describe his dreams in detail so that the therapist can help him uncover the hidden meaning of the dream images. Jake is describing the _____ content of his dreams. The therapist is trying to decipher the _____ content of Jake's dreams.
   a. lucid; circadian
   b. manifest; latent
   c. activated; synthesized
   d. restorative; adaptive

5. According to the activation–synthesis model, dreams are _____.
   a. meaningless
   b. symbolic representations of repressed wishes
   c. the subjective awareness of the brain's internally generated signals during sleep
   d. produced by newly consolidated memories

Hypnosis

KEY THEME

› During hypnosis, people respond to suggestions with changes in perception, memory, and behavior.

KEY QUESTIONS

› What characteristics are associated with responsiveness to hypnotic suggestions?

› What are some important effects of hypnosis?

› How has hypnosis been explained?

What is hypnosis? Definitions vary, but **hypnosis** can be defined as a cooperative social interaction in which the hypnotic participant responds to suggestions made by the hypnotist. These suggestions for imaginative experiences can produce changes in perception, memory, thoughts, and behavior (American Psychological Association, 2005).

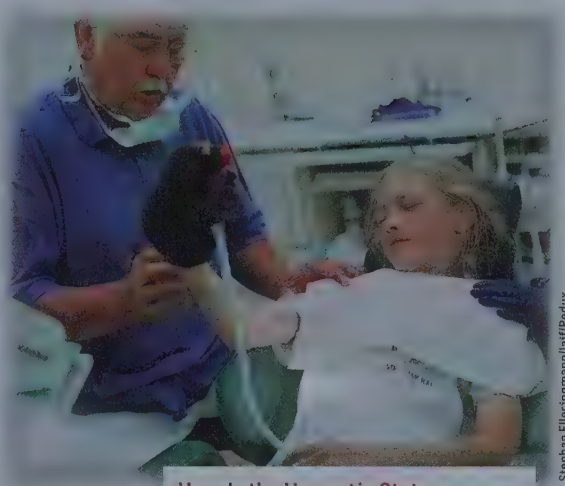
For many people the word *hypnosis* conjures up the classic but sinister image of a hypnotist slowly swinging a pocket watch back and forth. But, as psychologist John Kihlstrom (2001) explains, "The hypnotist does not hypnotize the individual. Rather, the hypnotist serves as a sort of coach or tutor whose job is to help the person become hypnotized." After experiencing hypnosis, some people are able to self-induce hypnosis.

The word *hypnosis* is derived from the Greek *hypnos,* meaning "sleep." The idea that the hypnotized person is in a sleeplike trance is still very popular among the general public. However, the phrase *hypnotic trance* is misleading and rarely used by researchers today. When hypnotized, people do *not* lose control of their behavior. Instead, they typically remain aware of where they are, who they are, and what is transpiring.

Rather than being a sleeplike trance, hypnosis is characterized by highly focused attention, increased responsiveness to suggestions, vivid images and fantasies, and a willingness to accept distortions of logic or reality. During hypnosis, the person temporarily suspends her sense of initiative and voluntarily accepts and follows the hypnotist's instructions (Hilgard, 1986a).

People vary in their responsiveness to hypnotic suggestions (see Nash, 2008). About 15 percent of adults are highly susceptible to hypnosis, and 10 percent are difficult or impossible to hypnotize. Children tend to be more responsive to hypnosis than are adults (Rhue, 2010).

The best candidates for hypnosis are individuals who approach the experience with positive, receptive attitudes. The expectation that you will be responsive to hypnosis also plays an important role (Silva & others, 2005). People who are highly susceptible to hypnosis have the ability to become deeply absorbed in fantasy and imaginary experience. For instance, they easily become absorbed in reading fiction, watching movies, and listening to music (Kihlstrom, 2007; Milling & others, 2010).



Stephan Ellering mann/laif/Redux

How Is the Hypnotic State Produced? In a willing volunteer, hypnosis can be induced in many different ways, but swinging a pocket watch is usually not one of them. Most often, hypnosis is induced by speaking in a calm, monotonous voice, suggesting that the person is becoming drowsy, sleepy, and progressively more relaxed. This dentist is hypnotizing a young patient so that she will be relaxed and pain-free during treatment.

Effects of Hypnosis

Deeply hypnotized subjects sometimes experience profound changes in their subjective experience of consciousness. They may report feelings of detachment from their bodies, profound relaxation, or sensations of timelessness. More commonly, hypnotized people converse normally and remain fully aware of their surroundings. Often, they will later report that carrying out the hypnotist's suggestions seemed to happen by itself. The action seems to take place outside the hypnotized person's will or volition.

Sensory and Perceptual Changes

Some of the most dramatic effects that can be produced with hypnosis are alterations in sensation and perception. Sensory changes that can be induced through hypnosis include temporary blindness, deafness, or a complete loss of sensation in some part of

REM sleep behavior disorder (RBD) A sleep disorder characterized by the brain's failure to suppress voluntary actions during REM sleep, resulting in the sleeper verbally and physically responding to the dream story.

hypnosis (hip-NO-sis) A cooperative social interaction in which the hypnotized person responds to the hypnotist's suggestions with changes in perception, memory, and behavior.



Courtesy of the late Ernest Hilgard, Photo News and Publications Service, Stanford University

Hypnotic Suppression of Pain In this classic photo taken at the Stanford Laboratory of Hypnosis Research, psychologist Ernest Hilgard (1904–2001) instructs this hypnotized young woman that she will feel no pain in her arm. Her arm is then immersed in circulating ice water for several minutes, and she reports that she does not experience any pain. In contrast, a nonhypnotized subject perceives the same experience as extremely painful and can keep his arm in the ice water for no more than a few seconds.

the body (Kihlstrom, 2007). For example, when the suggestion is made to a highly responsive subject that her arm is numb and cannot feel pain, she will not consciously experience the pain of a pinprick or of having her arm immersed in ice water. This property of hypnosis has led to its use as a technique in pain control (Patterson & others, 2010). Painful dental and medical procedures, including surgery, have been successfully performed with hypnosis as the only anesthesia (Hilgard & others, 1994; Salazar & others, 2010).

People can experience hallucinations under hypnosis. If a highly responsive hypnotic subject is told that a close friend is sitting in a chair on the other side of the room, she will not only report seeing the friend in vivid detail but can walk over and "touch" the other person. Under hypnosis, people can also *not* perceive something that *is* there. For example, if the suggestion is made that a jar of rotten eggs has no smell, a highly suggestible person will not consciously perceive any odor.

Hypnosis can also influence behavior outside the hypnotic state. When a **posthypnotic suggestion** is given, the person will carry out that specific suggestion after the hypnotic session is over. For example, under hypnosis, a student was given the posthypnotic suggestion that the number 5 no longer existed. He was brought out of hypnosis and then asked to count his fingers. He counted 11 fingers! Counting again, the baffled young man was at a loss to explain his results.

Some posthypnotic suggestions have been reported to last for months, but most last only a few hours or days. So, even if the hypnotist does not include some posthypnotic signal to cancel the posthypnotic suggestion, the suggestion will eventually wear off.

Hypnosis and Memory

Memory can be significantly affected by hypnosis (see Kihlstrom, 2007). In **posthypnotic amnesia,** a subject is unable to recall specific information or events that occurred before or during hypnosis. Posthypnotic amnesia is produced by a hypnotic suggestion that suppresses the memory of specific information, such as the subject's street address. The effects of posthypnotic amnesia are usually temporary, disappearing either spontaneously or when a posthypnotic signal is suggested by the hypnotist. When the signal is given, the information floods back into the subject's mind.

The opposite effect is called **hypermnesia,** which is enhancement of memory for past events through hypnotic suggestion. Police investigators sometimes use hypnosis in an attempt to enhance the memories of crime victims and witnesses. Despite the common belief that you can "zoom in" on briefly seen crime details under hypnosis, such claims are extremely exaggerated. Compared with regular police interview methods, hypnosis does *not* significantly enhance memory or improve the accuracy of memories (Mazzoni & others, 2010).

Many studies have shown that efforts to enhance memories hypnotically can lead to distortions and inaccuracies. In fact, hypnosis can greatly increase confidence in memories that are actually incorrect. False memories, also called *pseudomemories,* can be inadvertently created when hypnosis is used to aid recall (Mazzoni & Scoboria, 2007; Lynn & others, 2003).

Age Regression Through Hypnosis? Some people believe that hypnosis can allow you to re-experience an earlier stage of your life—a phenomenon called *age regression.* Under hypnosis, some adults *do* appear to relive experiences from their childhood, confidently displaying childlike speech patterns and behaviors. However, when attempts are made to verify specific details of the experiences, the details are usually inaccurate (Spanos, 1987–1988). Just as actual deafness and blindness are not produced by hypnotic suggestion, neither is a true return to childhood. Instead, hypnotic subjects combine fragments of actual memories with fantasies and ideas about how children of a particular age should behave.



Juame Guallaga footstock

Explaining Hypnosis

Consciousness Divided?

How can hypnosis be explained? Psychologist **Ernest R. Hilgard** (1986a, 1991, 1992) believed that the hypnotized person experiences **dissociation**—the splitting of consciousness into two or more simultaneous streams of mental activity. According to Hilgard's **neodissociation theory of hypnosis,** a hypnotized person consciously experiences one stream of mental activity that is responding to the hypnotist's suggestions. But a second, dissociated stream of mental activity is also operating, processing information that is unavailable to the consciousness of the hypnotized subject. Hilgard (1986a, 1992) referred to this second, dissociated stream of mental activity as the **hidden observer.** (The phrase *hidden observer* does *not* mean that the hypnotized person has multiple personalities.)

The neodissociation theory proposes that hypnosis produces a split in consciousness. A conscious segment complies with hypnotic suggestions, but a separate, dissociated segment unavailable to consciousness—the hidden observer—continues to process information (Bayne, 2007; Green & others, 2005).

Not all psychologists agree that hypnotic phenomena are due to dissociation, divided consciousness, or a hidden observer. In the Critical Thinking box on the next page, we examine this controversy more fully.

Limits and Applications of Hypnosis

Although the effects of hypnosis can be dramatic, there are limits to the behaviors that can be influenced by hypnosis. First, contrary to popular belief, you cannot be hypnotized against your will. Second, hypnosis cannot make you perform behaviors that are contrary to your morals and values. Thus, you're very unlikely to commit criminal or immoral acts under the influence of hypnosis—unless, of course, you find such actions acceptable (Hilgard, 1986b).

Third, hypnosis cannot make you stronger than your physical capabilities or bestow new talents. However, hypnosis *can* enhance physical skills or athletic ability by increasing self-confidence and concentration (Barker & Jones, 2006; Morgan, 2002). Table 4.2 provides additional examples of how hypnosis can be used to help people.

Can hypnosis be used to help you lose weight, stop smoking, or stop biting your nails? Hypnosis is not a magic bullet. However, research *has* shown that hypnosis can be helpful in modifying problematic behaviors, especially when used as part of a structured treatment program (Lynn & others, 2010). For example, when combined with cognitive-behavioral therapy or other supportive treatments, hypnosis has been shown to help motivated people quit smoking (Green & others, 2006; Elkins & others, 2006; Lynn & Kirsch, 2006). In children and adolescents, hypnosis can be an effective treatment for such habits as thumb-sucking, nail-biting, and compulsive hair-pulling (Rhue & others, 2010).

posthypnotic suggestion A suggestion made during hypnosis that the person should carry out a specific instruction following the hypnotic session.

posthypnotic amnesia The inability to recall specific information because of a hypnotic suggestion.

hypermnesia (high-perm-NEE-zha) The supposed enhancement of a person's memory for past events through a hypnotic suggestion.

dissociation The splitting of consciousness into two or more simultaneous streams of mental activity.

neodissociation theory of hypnosis Theory proposed by Ernest Hilgard that explains hypnotic effects as being due to the splitting of consciousness into two simultaneous streams of mental activity, only one of which the hypnotic participant is consciously aware of during hypnosis.

hidden observer Hilgard's term for the hidden, or dissociated, stream of mental activity that continues during hypnosis.

TABLE 4.2

Help Through Hypnosis

Research has demonstrated that hypnosis can effectively:

- Reduce pain and discomfort associated with cancer, rheumatoid arthritis, burn wounds, and other chronic conditions
- Reduce pain and discomfort associated with childbirth
- Reduce the use of narcotics to relieve postoperative pain
- Improve the concentration, motivation, and performance of athletes
- Lessen the severity and frequency of asthma attacks
- Eliminate recurring nightmares
- Enhance the effectiveness of psychotherapy in the treatment of obesity, hypertension, and anxiety
- Remove warts
- Eliminate or reduce stuttering
- Suppress the gag reflex during dental procedures

Sources: Campbell (1997); Czeisler & Dijk (2001); Refinetti (2000); M. Young (2000).

CRITICAL THINKING

Is Hypnosis a Special State of Consciousness?

Are the changes in perception, thinking, and behaviors that occur during hypnosis the result of a "special" or "altered" state of consciousness? Here, we'll consider the evidence for three competing points of view on this issue.

The State View: Hypnosis Involves a Special State

Considered the traditional viewpoint, the "state" explanation contends that hypnosis is a unique state of consciousness, distinctly different from normal waking consciousness (Kosslyn & others, 2000). The state view is perhaps best represented by Hilgard's *neodissociation theory of hypnosis*. According to this view, consciousness is split into two simultaneous streams of mental activity during hypnosis. One stream of mental activity remains conscious, but a second stream of mental activity—the one responding to the hypnotist's suggestions—is "dissociated" from awareness (Sadler & Woody, 2010). So according to the neodissociation theory, the hypnotized young woman shown on page 160 reported no pain because the painful sensations were dissociated from awareness.

The Non-State View: Ordinary Psychological Processes

Some psychologists flatly reject the notion that hypnotically induced changes involve a "special" state of consciousness. According to the *social-cognitive view of hypnosis*, subjects are responding to the *social demands* of the hypnosis situation. They act the way they think good hypnotic subjects are supposed to act, conforming to the expectations of the hypnotist, their own expectations, and situational cues (Lynn & Green, 2011). In this view, the "hypnotized" young woman on page 160 reported no pain because that's what she expected to happen during the hypnosis session.

To back up the social-cognitive theory of hypnosis, Nicholas Spanos (1991, 1994, 2005) and his colleagues amassed an impressive array of evidence showing that highly motivated people often perform just as well as hypnotized subjects in demonstrating pain reduction, amnesia, age regression, and hallucinations. Studies of people who simply *pretended* to be hypnotized have shown similar results. On the basis of such findings, non-state theorists contend that hypnosis can be explained in terms of rather ordinary psychological processes, including imagination, situational expectations, role enactment, compliance, and conformity (Wagstaff & Cole, 2005).

PET Scans During Hypnosis: Does the Brain Respond Differently?

Researcher Stephen Kosslyn and his colleagues (2000) conducted a brain-imaging study. Highly hypnotizable volunteers viewed two images of rectangles, one in bright colors and one in shades of gray, while lying in a PET scanner. The researchers measured activity in brain regions involved in color perception. While hypnotized, the participants were instructed to perform three tasks: (a) to see the images as they were; (b) to mentally "drain" color from the colored rectangles in order to see them in shades of gray; and (c) to mentally "add" color to the gray rectangles. These last two tasks were hypnosis-induced hallucinations.



Courtesy of Stephen Kosslyn, Ph.D. and William L. Thompson, Dept. of Psychology, Harvard University

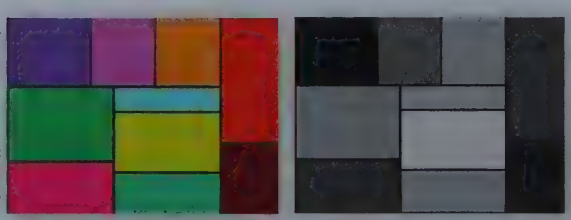
What did the PET scans reveal? When the hypnotized participants were instructed to perceive colored rectangles, color regions in the brain activated, *regardless* of whether the participants were shown colored or gray rectangles. When participants were instructed to perceive gray rectangles, color regions in the brain deactivated, *regardless* of whether the participants were shown colored or gray rectangles. In other words, brain activity reflected the hypnosis-induced hallucinations—not the actual images that were shown to the participants. On the basis of these findings, Kosslyn (2001) concluded, "Hypnosis is not simply 'role playing,' but does in fact reflect the existence of a distinct mental brain state."

The Imaginative Suggestibility View: Imagination

Psychologists Irving Kirsch and Wayne Braffman (2001) dismiss the idea that hypnotic subjects are merely acting. But they also contend that brain-imaging studies don't necessarily prove that hypnosis is a unique state. Rather, Kirsch and Braffman maintain that such studies emphasize individual differences in *imaginative suggestibility*—the degree to which a person is able to experience an imaginary state of affairs as if it were real.

Braffman and Kirsch (1999) have shown that many highly suggestible participants were just as responsive to suggestions when they had *not* been hypnotized as when they had been hypnotized. "Hypnotic responses reveal an astounding capacity that some people have to alter their experience in profound ways," Kirsch and Braffman (2001) write. "Hypnosis is only one of the ways in which this capacity is revealed. It can also be evoked—and almost to the same extent—without inducing hypnosis."

Despite the controversy over how best to explain hypnotic effects, psychologists do agree that hypnosis can be a highly effective therapeutic technique (Lynn & others, 2010).



Courtesy of Stephen Kosslyn, Ph.D. and William L. Thompson, Dept. of Psychology, Harvard University

CRITICAL THINKING QUESTIONS

- Does the fact that highly motivated subjects can "fake" hypnotic effects invalidate the notion of hypnosis as a unique state of consciousness? Why or why not?
- What kinds of evidence could prove or disprove the notion that hypnosis is a unique state of consciousness?

Meditation

meditation Any one of a number of sustained concentration techniques that focus attention and heighten awareness.

KEY THEME

› Meditation involves using one of various techniques to induce a state of focused attention and heightened awareness.

KEY QUESTIONS

› What are two general types of meditation?

› What are some effects of meditation?

Meditation refers to a group of techniques that induce an altered state of focused attention and heightened awareness. Taking many forms, meditation has been an important part of religious practices throughout the world for thousands of years (Nelson, 2001; Wallace, 2009). However, meditation can also be practiced as a secular technique, independent of any religious tradition or spiritual context (Plante, 2010).

Common to all forms of meditation is the goal of *controlling or training attention*. There are literally hundreds of different meditation techniques, but they can be divided into two general categories (Slagter & others, 2011). *Focused attention techniques* involve focusing awareness on a visual image or an object; the sensation of breathing; or a sound, word, or phrase. Sometimes a short word or religious phrase, called a *mantra,* is repeated mentally.

Focused attention techniques involve monitoring and regulating the quality of attention. It may sound simple, but try it: Sit quietly and try to focus your attention on a simple stimulus in your own environment—perhaps a pebble or even a blank Post-it note. You'll quickly realize how hard it is to maintain focus on the object, to notice when your attention is distracted by thoughts or other environmental stimuli, and to return your focus to the chosen object.

In contrast, *open monitoring techniques* involve monitoring the content of experience from moment to moment (Slagter & others, 2011). Rather than concentrating on an object, sound, or activity, the meditator engages in present-centered awareness of the "here and now." When distracting thoughts arise—as they surely will—the practitioner notes the thought and returns to a state of open, non-reflective awareness. *Mindfulness*, a meditation technique that has become increasingly widespread in psychological research and clinical practice, is a form of opening-up meditation (Chiesa & Malinowski, 2011; Williams, 2010).

In practice, focused attention and open monitoring techniques often overlap, especially when people are just learning to meditate. For example, beginning mindfulness meditation often starts with focused attention on your breath to calm or "settle" the mind and reduce distractions (Shapiro & Carlson, 2009). Only gradually do practitioners transition to a more open attentiveness to whatever occurs in awareness, whether it be a sensation, thought, or feeling (Slagter & others, 2011).

Many people assume that meditation involves entering a sort of trancelike state that resembles drowsiness or hypnosis. In fact, mindfulness meditators report the *opposite* effect—a state of heightened awareness and sensitivity to thoughts, internal sensations, and external stimuli such as sounds and smells (Ricard, 2010).



David Sutherland/Getty Images

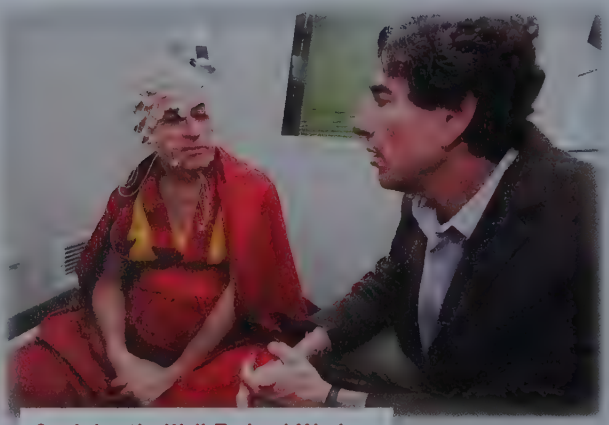


AP Photo/Herald-Leader, David Perry

Meditation in Different Cultures

(Left) Like this group in Hanoi, Vietnam, many people throughout Asia begin their day with *tai chi*, often meeting in parks and other public places. Tai chi is a form of meditation that involves a structured series of slow, smooth movements. Sometimes described as "meditation in motion," tai chi has existed for over 2,000 years.

(Right) Zen Buddhist practitioners in an American temple practice *zazen,* or "just sitting," a form of open monitoring meditation (Austin, 2009). Originating in China, Zen is found in many Asian countries, especially Japan, Korea, and Vietnam. Over the past few decades, Zen Buddhism has become increasingly popular in the United States and other western countries.



Jeff Miller/University of Wisconsin-Madison

Studying the Well-Trained Mind
Neuroscientist and psychologist Richard Davidson confers with Buddhist monk Matthieu Ricard during an EEG study that monitored brain waves during different meditative practices (Lutz & others, 2004). Ricard, a former molecular biologist, helped design the studies, held under the auspices of the Mind and Life Institute (www.mindandlife.org). The 14th Dalai Lama has been instrumental in encouraging such collaborations between Western scientists and Tibetan Buddhist practitioners (Ekman & others, 2005). As the Dalai Lama wrote, "Buddhists have a 2,500-year history of investigating the workings of the mind.... Using imaging devices that show what occurs in the brain during meditation, Dr. Davidson has been able to study the effects of Buddhist practice for cultivating compassion, equanimity, or mindfulness" (Gyatso, 2003).

Scientific Studies of the Effects of Meditation

Much of the early research on meditation investigated its use as a relaxation technique that relieved stress and improved cardiovascular health. The meditation technique that was most widely used in this early research was *transcendental meditation* or *TM,* a focused attention technique that involved mentally repeating a mantra given to the practitioner by a teacher. Many studies showed that even beginning meditators practicing TM experienced a state of lowered physical arousal, including a decrease in heart rate, lower blood pressure, and changes in brain waves associated with relaxation (C.N. Alexander & others, 1994; Benson, 2010).

Contemporary research on meditation is more wide-ranging. Much of this research has been sponsored by the Mind and Life Institute and the 14th Dalai Lama (see photo). Since the late 1980s, the Mind and Life Institute has fostered a unique scientific collaboration among meditation practitioners, psychologists, and other scientists (Engle, 2011; Hetherington & Zajonc, 2006). Today, researchers hope to learn more about the nature of conscious experience as well as meditation's effects on attention, emotional control, health, and the brain (Slagter & others, 2011).

One difficulty in studying meditation is that there are literally hundreds of different meditation techniques. Many of today's research studies involve mindfulness techniques, partly because they can be easily taught in a secular context (Davidson, 2010; Shapiro & Carlson, 2009). But even mindfulness-based practices can vary a great deal (Chiesa & Malinowski, 2011). And, study participants may range from novice meditators to people who have practiced meditation for decades. These qualifications need to be kept in mind. However, carefully controlled studies have found that meditation can:

- improve concentration, perceptual discrimination, and attention (Lutz & others, 2009; Maclean & others, 2010; Slagter & others, 2007)
- increase working memory in American marines during basic training (Jha & others, 2010)
- improve emotional control and well-being (Davidson, 2005; Sahdra & others, 2011; Farb & others, 2010; Erisman & Roemer, 2010)
- reduce stress and minimize its physical effects (Dusek & others, 2006, 2008; Jacobs & others, 2011; Shapiro & others, 2011)

Are years of disciplined practice needed to experience the benefits of meditation practice? *No.* In one study, college students with no prior meditation experience learned mindfulness meditation and practiced it for just 20 minutes a day for four days (Zeidan & others, 2010). As compared to a matched control group of students who listened to an audiobook recording of *The Hobbit,* the meditation group significantly improved on several cognitive tasks, such as a memory test. But the most striking result was on a task that required concentration and sustained attention. The meditators, but not the *Hobbit*-listeners, sharply improved their ability to focus and sustain attention.

In a similar study, just four days of practice allowed new meditators to reduce their ratings of a painful stimulus's intensity by 40% and unpleasantness by 57%. The pain relief produced by meditation was greater than that produced by morphine or other powerful pain-killers, which typically reduce pain ratings by about 25% (Zeidan & others, 2011). Functional MRI scans of the meditators' brains showed a steep reduction of activity in the *primary somatosensory cortex,* which processes sensations of pain, touch, and pressure.

Scientific interest in meditation has dramatically increased in recent years. Some psychologists are using meditation to study how intensive mental training affects basic psychological processes, such as attention and memory (Slagter & others,

FOCUS ON NEUROSCIENCE

Meditation and the Brain

Research on *neuroplasticity*—the brain's capacity to change with experience—has conclusively shown that learning a new skill, such as juggling, changes the physical structure of the brain (Draganski & others, 2004, 2006). So, it turns out, does acquiring new *mental* skills or even just new information. For example, after just two hours of training, adults who learned new color names showed measurable brain changes (Kwok & others, 2011). These changes involved increases in *gray matter*—that is, increases in the size and density of cell bodies and dendrites of neurons in the cortex.

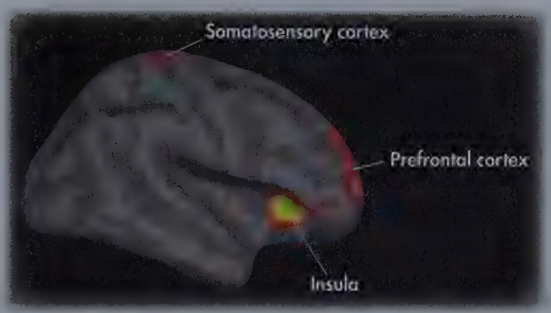
Does meditation, like other forms of mental practice or training, also affect brain structure? One of the earliest findings that meditation was associated with changes in the brain came from the lab of Harvard neuroscientist Sara Lazar. Lazar and her colleagues (2005) recruited a group of 20 experienced Insight meditation practitioners. Insight meditation is an advanced form of mindfulness meditation, combining traditional mindfulness practice with focused attention on internal experience. The meditation practitioners had an average of 9 years experience meditating, but all were typical western practitioners, incorporating their daily practice into a busy schedule of family and work responsibilities.

MRI scans showed that several cortical areas were thicker in the meditators' brains than in the brains of a control group of nonmeditators who were matched for gender and age. More specifically, the meditators had more gray matter in regions associated with attention, emotion, and sensory processing.

Interestingly, in two regions, thickness was correlated with years of meditation experience—the longer the participants had been meditating, the thicker the cortical regions. And, the differences were *most* pronounced among the older participants. Some cortical areas in the meditators were as thick as corresponding areas in control participants who were twenty years younger. Normally, the cortex gradually shrinks with age, so one intriguing implication of this study was that meditation might help prevent or even reverse the normal age-related thinning of the cortex.

Because this study was correlational, however, it was not possible to attribute the cortical differences to meditation alone. Some other factor could have contributed to the differences between the experienced meditators and the non-meditating controls. A new experimental study, however, overcame that limitation (Hölzel & others, 2011). MRI scans were taken of participants two weeks before and two weeks after they learned to meditate in an 8-week stress-reduction course. These scans were compared against scans of control group participants who did *not* meditate. The new meditators, but not the controls, showed gray-matter density increases in several cortical areas, including the hippocampus, cerebellum, and other areas associated with memory, emotion, and awareness (Hölzel & others, 2011).

As researchers continue to investigate the beneficial effects of meditation, neuroscientists hope to uncover some of the neural changes that might underlie changes in behavior, emotion, and cognition. Meditation techniques are also increasingly used as a scientific tool to study neuroplasticity in the adult brain (Slagter & others, 2011). So far, no single pattern of brain changes has been found to be associated with meditation, but that is not surprising given the diversity of techniques and meditation experience among participants in different research studies. As neuroscientist Richard Davidson (2011) notes, the term "meditation" is like the term "sports"—it includes a vast range of different activities, skills, and varying levels of individual expertise and behavior.



Courtesy Dr. Sara Lazar

A study by Sara Lazar and her colleagues (2005) found that cortical areas shown in red and yellow were significantly thicker in meditators than in a matched control group. The somatosensory cortex and insula are both associated with sensory awareness, with the insula specifically linked to awareness of internal body sensations and signals. According to the researchers, the particular region of the prefrontal cortex that was thicker in the meditators than the controls is thought to be associated with the integration of thoughts and feelings.

2011). Brain-imaging technology has allowed neuroscientists to document brain changes *during* meditation and brain changes that seem to result as an *effect* of meditation (Grant & others, 2010; Treadway & Lazar, 2010, 2009). As described in the Focus on Neuroscience box, meditation has also been used to study *neuroplasticity*—how mental training affects the brain's structure

Increasingly, meditative practice is also incorporated into psychotherapy (Davis & Hayes, 2011; Plante, 2010). Today, many psychologists are studying the use of meditation techniques to help tackle psychological problems ranging from eating disorders and substance abuse to depression, anxiety, and even more serious disorders (see Didonna, 2009). We return to the topic of meditation in Chapter 13 on Stress and Health, and discuss mindfulness-based therapies in Chapter 15.

If you would like to try a simple meditation technique, turn to page 557 in Chapter 13.

CONCEPT REVIEW 4.3

Hypnosis and Meditation

1. Jill is very responsive to hypnotic suggestions. Jill probably _____.
   a. has a very vivid imagination and a rich fantasy life
   b. has a very negative attitude toward hypnosis
   c. is easily distracted
   d. can be easily hypnotized against her will
2. While Matt is under hypnosis, the hypnotist tells him that he remembers being lost in a shopping mall as a young child. After being brought out of hypnosis, Matt is completely convinced that the incident occurred and describes it in detail. The hypnotist has successfully created _____.
   a. a posthypnotic suggestion
   b. posthypnotic amnesia
   c. hypermnesia
   d. a pseudomemory
3. To help deal with the stress of his busy schedule, Erik meditates for about 15 minutes on the commuter train as he is going to and from work. His meditation consists of mentally repeating the word *peace* without becoming distracted by passing thoughts. Erik is using a(n) _____ technique of meditation.
   a. focused attention
   b. relaxation
   c. mindfulness
   d. imaginative susceptibility
4. Scientific studies on meditation have shown that:
   a. experienced meditators enter a drowsy, trance-like state that is essentially no different from resting with your eyes closed
   b. meditation's benefits can best be explained by non-state, social-cognitive processes
   c. meditation can relieve stress, but has no effect on cognition, emotion, or other psychological processes
   d. even beginning meditators can experience improvements in attention and memory

Psychoactive Drugs

KEY THEME

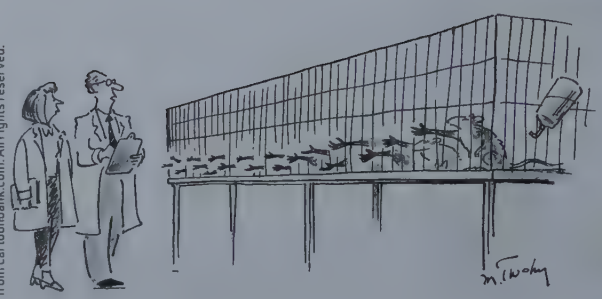
› Psychoactive drugs alter consciousness by changing arousal, mood, thinking, sensations, and perceptions.

KEY QUESTIONS

› What are four broad categories of psychoactive drugs?
› What are some common properties of psychoactive drugs?
› What factors influence the effects, use, and abuse of drugs?

Psychoactive drugs are chemical substances that can alter arousal, mood, thinking, sensation, and perception. In this section, we will look at the characteristics of four broad categories of psychoactive drugs:

1. *Depressants*—drugs that depress, or inhibit, brain activity
2. *Opiates*—drugs that are chemically similar to morphine and that relieve pain and produce euphoria
3. *Stimulants*—drugs that stimulate, or excite, brain activity
4. *Psychedelic drugs*—drugs that distort sensory perceptions



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"At this point, we know it's addictive."

Common Effects of Psychoactive Drugs

Addiction is a broad term that refers to a condition in which a person feels psychologically and physically compelled to take a specific drug. People experience **physical dependence** when their body and brain chemistry have physically adapted to a drug. Many physically addictive drugs gradually produce **drug tolerance,** which means that increasing amounts of the drug are needed to gain the original, desired effect.

When a person becomes physically dependent on a drug, abstaining from the drug produces withdrawal symptoms. **Withdrawal**

symptoms are unpleasant physical reactions to the lack of the drug, plus an intense craving for it. Withdrawal symptoms are alleviated by taking the drug again. Often, the withdrawal symptoms are opposite to the drug's action, a phenomenon called the **drug rebound effect.** For example, withdrawing from stimulating drugs, like the caffeine in coffee, may produce depression and fatigue. Withdrawal from depressant drugs, such as alcohol, may produce excitability.

Each psychoactive drug has a distinct biological effect. Psychoactive drugs may influence many different bodily systems, but their consciousness-altering effects are primarily due to their effect on the brain. Typically, these drugs influence brain activity by altering synaptic transmission among neurons. As we discussed in Chapter 2, drugs affect synaptic transmission by increasing or decreasing neurotransmitter amounts or by blocking, mimicking, or influencing a particular neurotransmitter's effects (see Figure 2.7). Chronic drug use can also produce long-term changes in brain structures and functions, as discussed in the Focus on Neuroscience box on the next page.

The biological effects of a drug can vary considerably from person to person. An individual's race, gender, age, and weight may influence the intensity of a particular drug's effects. For example, many Asians and Asian Americans have a specific genetic variation that makes them much more responsive to alcohol's effects. In turn, this heightened sensitivity to alcohol is associated with significantly lower rates of alcohol dependence seen among people of Asian heritage as compared to other races (Cook & others, 2005; Kufahl & others, 2008).

. Psychological and environmental factors can also influence a drug's effects. An individual's response to a drug can be greatly affected by his or her personality characteristics, mood, expectations, experience with the drug, and the setting in which the drug is taken (Kufahl & others, 2008).

In contrast to drug use, **drug abuse** refers to recurrent drug use that results in the disruption of academic, social, or occupational functioning, or in legal or psychological problems (American Psychiatric Association, 2000a). In the United States, rather than illicit drugs, alcohol is, by far, the most widely abused substance (Substance Abuse and Mental Health Services Administration, 2009).

The effects of psychoactive drugs are especially unpredictable when combined. At one time, most fatal drug overdoses were caused by illegal narcotics. Today, however, most of the 20,000 unintentional overdose deaths that occur each year are caused by prescription drugs, including painkillers, antianxiety medications, and antidepressant medications. Contrary to what most people think, illicit drugs like cocaine, heroin, and methamphetamines account for just over a third (39%) of fatal overdoses (Paulozzi & Annest, 2007; Paulozzi, 2008).



Fotosearch/agefotostock

Psychoactive Drugs Around the World How pervasive is the use of psychoactive drugs? At an outdoor café in Amsterdam, these young adults meet to socialize and people-watch—accompanied by coffee, cigarettes, and alcohol. Although not used in every culture, caffeine, nicotine, and alcohol are three of the most widely used psychoactive substances in the world.

The Depressants

Alcohol, Barbiturates, Inhalants, and Tranquilizers

KEY THEME

› Depressants inhibit central nervous system activity, while opiates are addictive drugs that relieve pain and produce euphoria.

KEY QUESTIONS

› What are the physical and psychological effects of alcohol?

› How do barbiturates, inhalants, and tranquilizers affect the body?

› What are the effects of opiates, and how do they affect the brain?

The **depressants** are a class of drugs that depress or inhibit central nervous system activity. In general, depressants produce drowsiness, sedation, or sleep. Depressants also relieve anxiety and lower inhibitions. All depressant drugs are potentially physically addictive. Further, the effects of depressant drugs are *additive,* meaning that the sedative effects are increased when depressants are combined.

- **psychoactive drug** A drug that alters consciousness, perception, mood, and behavior.
- **physical dependence** A condition in which a person has physically adapted to a drug so that he or she must take the drug regularly in order to avoid withdrawal symptoms.
- **drug tolerance** A condition in which increasing amounts of a physically addictive drug are needed to produce the original, desired effect.
- **withdrawal symptoms** Unpleasant physical reactions, combined with intense drug cravings, that occur when a person abstains from a drug on which he or she is physically dependent.
- **drug rebound effect** Withdrawal symptoms that are the opposite of a physically addictive drug's action.
- **drug abuse** Recurrent drug use that results in disruptions in academic, social, or occupational functioning, or in legal or psychological problems.
- **depressants** A category of psychoactive drugs that depress or inhibit brain activity.

FOCUS ON NEUROSCIENCE

The Addicted Brain: Diminishing Rewards

Addictive drugs include alcohol, cocaine, heroin, nicotine, and the amphetamines. Although their effects are diverse, these addictive drugs share one thing in common: They all activate dopamine-producing neurons in the brain's reward system (Li & others, 2007; Volkow & others, 2009). The initial dopamine surge in response to an addictive drug is a powerful brain reward, one that prompts the person to repeat the drug-taking behavior (Self, 2005).

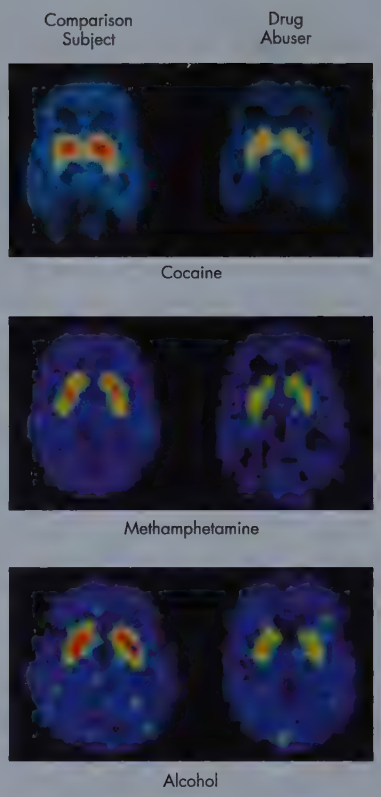
The brain's reward system evolved to reinforce behaviors that promote survival, such as eating and sexuality. Many pleasurable activities including exercising, listening to music, and even looking at an attractive person can cause a temporary increase in dopamine.

In contrast to naturally rewarding activities and substances, addictive drugs hijack the brain's reward system. Initially, the drug produces the intense dopamine-induced feelings of euphoria. But with repeated drug use, the brain's reward pathways *adapt* to the high dopamine levels. One result is that the availability of dopamine receptors is down-regulated or greatly reduced (Volkow & others, 2011). Along with decreased dopamine activity, other biochemical changes dampen or inhibit the brain's reward circuits, reducing the pleasurable effects of the abused substance. These adaptations create the conditions for *drug tolerance*—more of the substance is now needed to produce a response that is similar to the drug's original effect (Nestler & Malenka, 2004).

As the brain's reward circuits down-regulate to counter the dopamine surge, another change occurs. The normally reinforcing experiences of everyday life are no longer satisfying or pleasurable. Emotionally, the addict experiences depression, boredom, and apathy (Little & others, 2003).

While lying in a PET scanner and viewing images of laughing children or other pleasurable scenes, the cocaine addict's brain shows little or no dopamine response. But when shown images associated with cocaine use—a coke spoon, the neighborhood where the drugs were bought—the brain's reward circuit "lights up like a Christmas tree" (Hoffman & Froemke, 2007). Thus, everyday experiences are no longer enjoyable. The addicted person needs the substance not to get high but just to feel "normal."

Because the neurons in the brain's reward system have physically changed, they can remain hypersensitive to such cues associated with the abused substance for months and even years after drug use has ended. Simply being exposed to drug-related stimuli or stressful life events can trigger craving—and relapse (Volkow & others, 2006, 2011).



Reprinted with permission from the American Journal of Psychiatry. Copyright 2002. American Psychiatric Association. Goldstein, Rita Z. & Volkow, Nora D. (2002). Drug addiction and its underlying neurobiological basis: Neuroimaging evidence for the involvement of the frontal cortex. *American Journal of Psychiatry*, 159, 1642–1652.

Common Effects of Addictive Drugs The intoxicating effects of all addictive drugs are produced by rapidly increasing dopamine levels in the brain's reward system (Volkow & others, 2009, 2011). As the brain adjusts to the effects of drug abuse, long-term changes occur in the brain's reward circuitry. The number of dopamine receptors are indicated by orange and yellow in the scans above. Drug abuse sharply reduces the number of dopamine receptors in the brain's reward system.

Deadly Additive Drug Effects Having already been nominated for an Academy Award for the 2005 movie *Brokeback Mountain*, actor Heath Ledger was receiving advance critical acclaim for his portrayal of "The Joker" in the 2008 movie *The Dark Knight*. But in January of 2008, Ledger died from an accidental overdose in his New York apartment. In the weeks before his death, Ledger had complained about severe sleeping difficulties. The medical examination found multiple prescription drugs in his body, including two kinds of narcotic painkillers, two kinds of antianxiety drugs, and two kinds of sleeping medications. None of the legally prescribed medications had been taken in excess. Even so, the combination produced a lethal additive drug effect, depressing his brain's vital life functions to the point that respiratory failure occurred. Heath Ledger was 28.



AP Photo/Dima Gavrysh, File

Alcohol

Weddings, parties, and other social gatherings often include alcohol, a tribute to its relaxing and social lubricating properties. Used in small amounts, alcohol reduces tension and anxiety. But even though it is legal for adults and readily available, alcohol also has a high potential for abuse. Partly because of its ready availability, many drug experts consider alcohol to have the highest social cost of all the addictions (Nutt & others, 2010; Hawkey & others, 2011). Consider these points:

- Excessive alcohol consumption accounts for an estimated 79,000 deaths annually in the United States and is a factor in the deaths of over 1,400 college students each year (Chavez & others, 2011; Wechsler & Nelson, 2008).
- Alcohol is involved in more than half of all assaults, homicides, and motor vehicle accidents (Julien, 2008).
- Alcohol intoxication is often a factor in domestic and partner violence, child abuse, and public violent behavior (Shepherd, 2007; Easton & others, 2007).
- Drinking during pregnancy is a leading cause of birth defects. It is the most common cause of mental retardation—and the only preventable one (Niccols, 2007).

An estimated 17 million Americans are either dependent upon alcohol or have serious alcohol problems. They drink heavily on a regular basis and suffer social, occupational, and health problems as a result (Substance Abuse and Mental Health Services Administration, 2009).

However, the numerous adverse health and social consequences associated with excessive drinking—health problems, injuries, accidents, violence—are not limited to those who are alcohol dependent. In fact, most of those who periodically drink heavily or drive while intoxicated do *not* meet the formal criteria for alcohol dependence (Woerle & others, 2007).



Jake Schoellkopf/AP Photos

The Dangers of Driving Under the Influence Intoxicated drivers have impaired perceptual ability and psychomotor functions, delayed reaction time, and poor coordination. They are also likely to display impaired judgment, poor impulse control, and an inflated self-image. This deadly combination results in more than 17,000 U.S. traffic deaths each year.

What Are Alcohol's Psychological Effects? People are often surprised that alcohol is classified as a depressant. Initially, alcohol produces a mild euphoria, talkativeness, and feelings of good humor and friendliness, leading many people to think of alcohol as a stimulant. But these subjective experiences occur because alcohol *lessens inhibitions* by depressing the brain centers responsible for judgment and self-control. Reduced inhibitions and self-control contribute to the aggressive and violent behavior sometimes associated with alcohol abuse. But the loss of inhibitions affects individuals differently, depending on their environment and expectations regarding alcohol's effects.

How Does Alcohol Affect the Body? As a general rule, it takes about one hour to metabolize the alcohol in one drink, which is defined as 1 ounce of 80-proof whiskey, 4 ounces of wine, or 12 ounces of beer. All three drinks contain the same amount of alcohol; the alcohol is simply more diluted in beer than in hard liquor.

Factors such as body weight, gender, food consumption, and the rate of alcohol consumption also affect blood alcohol levels. A slender person who quickly consumes three drinks on an empty stomach will become more than twice as intoxicated as a heavier person who consumes three drinks with food. Women metabolize alcohol more slowly than do men. If a man and a woman of equal weight consume the same number of drinks, the woman will become more intoxicated. Table 4.3 on the next page shows the behavioral effects and impairments associated with different blood alcohol levels.

Binge drinking is a particularly risky practice. *Binge drinking* is defined as five or more drinks in a row for men, or four or more drinks in a row for women (Cooke & others, 2010). Every year, several college students die of alcohol poisoning after ingesting large amounts of liquor in a short amount of time. Less well publicized are the other negative effects associated with binge drinking, including aggression, sexual assaults, accidents, and property damage (Mitka, 2009; Wechsler & Nelson, 2008).

TABLE 4.3

Behavioral Effects of Blood Alcohol Levels

Blood Alcohol Level	Behavioral Effects
0.05%	Lowered alertness; release of inhibitions; impaired judgment
0.10%	Slowed reaction times; impaired motor function; less caution
0.15%	Large, consistent increases in reaction time
0.20%	Marked depression in sensory and motor capability; obvious intoxication
0.25%	Severe motor disturbance; staggering; sensory perceptions greatly impaired
0.30%	Stuporous but conscious; no comprehension of the world around them
0.35%	Surgical anesthesia; minimal level causing death
0.40%	About half of those at this level die



Bob Daemmrich/Stock Boston

This Is Fun? According to a national survey of college students, more than half "drank to get drunk" in the previous year (Wechsler & Nelson, 2008). Despite the deaths from alcohol poisoning of several college students each year, binge drinking and public drunkenness remain common at spring break celebrations. College students currently spend $5.5 billion a year on alcohol, more than they spend on textbooks, soft drinks, tea, milk, juice, and coffee combined (Nelson & others, 2005).

In a person who is addicted to alcohol, withdrawal causes rebound hyperexcitability in the brain. The severity of the withdrawal symptoms depends on the level of physical dependence. With a low level of dependence, withdrawal may involve disrupted sleep, anxiety, and mild tremors ("the shakes"). At higher levels of physical dependence on alcohol, withdrawal may involve confusion, hallucinations, and severe tremors or seizures. Collectively, these severe symptoms are called *delirium tremens,* or the *DTs.* In cases of extreme physical dependence, alcohol withdrawal, in the absence of medical supervision, can cause seizures, convulsions, and even death.

Inhalants

Inhalants are chemical substances that are inhaled to produce an alteration in consciousness. Paint solvents, spray paint, gasoline, and aerosol sprays are just a few of the substances that are abused in this way. Inhalant abuse is most prevalent among adolescent and young adult males.

Although psychoactive inhalants do not have a common chemical structure, they generally act as central nervous system depressants. At low doses, they may cause relaxation, giddiness, and reduced inhibition. At higher doses, inhalants can lead to hallucinations and a loss of consciousness.

Inhalants are very dangerous. Suffocation is one hazard, but many inhaled substances are also toxic to the liver and other organs. Chronic abuse also leads to neurological and brain damage. One study compared cognitive functioning in cocaine and inhalant abusers. Both groups scored well below the normal population, but inhalant users scored even below the cocaine abusers on problem-solving and memory tests. MRI scans showed that the inhalant users also had more extensive brain damage than the cocaine users (Mathias, 2002; Rosenberg & others, 2002).

inhalants Chemical substances that are inhaled to produce an alteration in consciousness.

barbiturates (barb-ITCH-yer-ets) A category of depressant drugs that reduce anxiety and produce sleepiness.

tranquilizers Depressant drugs that relieve anxiety.

opiates (OH-pee-ets) A category of psychoactive drugs that are chemically similar to morphine and have strong pain-relieving properties.

Barbiturates and Tranquilizers

Barbiturates are powerful depressant drugs that reduce anxiety and promote sleep, which is why they are sometimes called "downers." Barbiturates depress activity in the brain centers that control arousal, wakefulness, and alertness. They also depress the brain's respiratory centers.

Like alcohol, barbiturates at low doses cause relaxation, mild euphoria, and reduced inhibitions. Larger doses produce a loss of coordination, impaired mental

functioning, and depression. High doses can produce unconsciousness, coma, and death. Because of the additive effect of depressants, barbiturates combined with alcohol are particularly dangerous.

Common barbiturates include the prescription sedatives *Seconal* and *Nembutal.* The illegal drug *methaqualone* (street name *quaalude*) is almost identical chemically to barbiturates and has similar effects.

Barbiturates produce both physical and psychological dependence. Withdrawal from low doses of barbiturates produces irritability and REM rebound nightmares. Withdrawal from high doses of barbiturates can produce hallucinations, disorientation, restlessness, and life-threatening convulsions.

Tranquilizers are depressants that relieve anxiety. Commonly prescribed tranquilizers include *Xanax, Valium, Librium,* and *Ativan.* Chemically different from barbiturates, tranquilizers produce similar, although less powerful, effects. We will discuss these drugs in more detail in Chapter 15, on therapies.



Prescription Depressant Drugs—and Unintentional Overdoses Michael Jackson's sudden death from cardiac arrest made headlines around the world. An autopsy revealed that his unexpected death was caused by a lethal combination of depressant drugs: the antianxiety drugs Ativan, Valium, and Medved, plus the anesthetic drug, propofol. Propofol is normally used to sedate patients before surgery. The propofol and other drugs had been intravenously administered by Jackson's personal physician to help Jackson sleep (Moore, 2009). In combination, these powerful but legally prescribed depressants stopped Jackson's heart.

Carl De Souza/AFP/Getty Images

The Opiates

From Poppies to Demerol

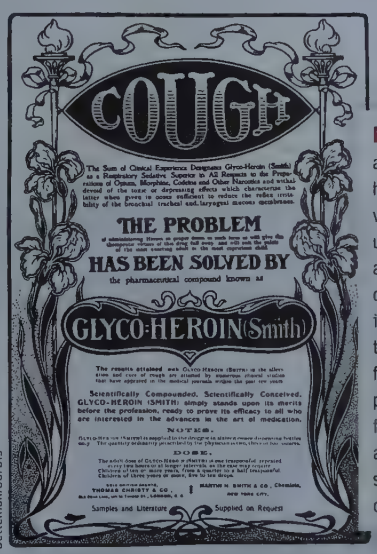
Often called *narcotics,* the **opiates** are a group of addictive drugs that relieve pain and produce feelings of euphoria. Natural opiates include *opium,* which is derived from the opium poppy; *morphine,* the active ingredient in opium; and *codeine,* which can be derived from either opium or morphine. Synthetic and semisynthetic opiates include *heroin, methadone, oxycodone,* and the prescription painkillers *OxyContin, Vicodin, Percodan, Demerol,* and *Fentanyl.*

Opiates produce their powerful effects by mimicking the brain's own natural painkillers, called *endorphins.* Opiates occupy endorphin receptor sites in the brain. When used medically, opiates alter an individual's reaction to pain not by acting at the pain site but by reducing the brain's perception of pain. It was once believed that people who took medically prescribed opiates or synthetic opioids rarely developed drug tolerance or addiction. Today, physicians and researchers are more aware of the addictive potential of these drugs. Most patients do *not* abuse prescription pain pills or develop physical dependence or addiction (Noble & others, 2008).

Among the most dangerous opiates is *heroin.* When injected into a vein, heroin reaches the brain in seconds, creating an intense rush of euphoria that is followed by feelings of contentment, peacefulness, and warmth. Withdrawal is not life threatening, but it does produce unpleasant drug rebound symptoms. Withdrawal symptoms include an intense craving for heroin, fever, chills, muscle cramps, and gastrointestinal problems.

Heroin is not the most commonly abused opiate. That distinction belongs to the prescription pain pills, especially *OxyContin,* which combines the synthetic opioid *oxycodone* with a time-release mechanism. Street users discovered that crushing the OxyContin tablets easily destroyed the time-release mechanism. The resulting powder can be snorted, smoked, or diluted in water and injected—resulting in a rapid, intense high.

The synthetic opiates are now the most commonly prescribed class of medications in the United States (Volkow & others, 2011). Abuse of OxyContin and similar prescription pain pills such as hydrocodone and oxycodone has skyrocketed in recent years (Fischer & Rehm, 2007). In fact, in terms of frequency of illicit use, prescription pain pills are second only to marijuana (Savage, 2005). As with any of the opiates, prescription pain pills are especially dangerous when mixed with other drugs, such as alcohol or barbiturates. In fact, deaths from accidental overdose of opiates quadrupled between 1999 and 2007. Opiate overdose is now the second leading cause of accidental death in the United States, second only to motor vehicle accidents (Volkow & McLellan, 2011).



Bettmann/Corbis

Heroin Cough Syrup Opium and its derivatives, including heroin, morphine, and codeine, were legal in the United States until 1914. In the late nineteenth and early twentieth centuries, opiates were commonly used in over-the-counter medications for a variety of ailments from sleeplessness to "female problems" (Musto, 1991). This ad for "Glyco-Heroin" cough syrup appeared in 1904. Codeine is still used in some prescription cough syrups.

The Stimulants

Caffeine, Nicotine, Amphetamines, and Cocaine

KEY THEME

› Stimulant drugs increase brain activity, while the psychedelic drugs create perceptual distortions, alter mood, and affect thinking.

KEY QUESTIONS

› What are the general effects of stimulants and the specific effects of caffeine, nicotine, amphetamines, and cocaine?

› What are the effects of mescaline, LSD, and marijuana?

› What are the "club drugs," and what are their effects?

Stimulants vary in legal status, the strength of their effects, and the manner in which they are taken. All stimulant drugs, however, are at least mildly addicting, and all tend to increase brain activity.

Caffeine and Nicotine

Caffeine is the most widely used psychoactive drug in the world and is found in such common sources as coffee, tea, cola drinks, chocolate, and certain over-the-counter medications (see Table 4.4). Caffeine promotes wakefulness, mental alertness, vigilance, and faster thought processes by stimulating the release of dopamine in the brain's prefrontal cortex.

Caffeine also produces its mentally stimulating effects by blocking *adenosine* receptors in the brain. *Adenosine* is a naturally occurring compound in your body that influences the release of several neurotransmitters in the central nervous system. As noted earlier, adenosine levels gradually increase the longer a person is awake. When adenosine levels reach a certain level in your body, the urge to sleep greatly intensifies. Caffeine staves off the urge and promotes alertness by blocking adenosine's sleep-inducing effects (Roehrs & Roth, 2008). Caffeine's adenosine-blocking ability has another effect—it stimulates *indirect* and mild dopamine release in the brain's reward system.

Yes, coffee drinkers, there is ample scientific evidence that caffeine is physically addictive. However, because the brain reward effects of caffeine are mild, coffee junkies are not likely to ransack the nearest Starbucks or take hostages if deprived of their favorite espresso. However, they will experience withdrawal symptoms if they abruptly

Legal Stimulants: Caffeine, Nicotine, and Conversation These young men in Bangalore, India, meet for a coffee and a smoke. Although cigarettes have increasingly been banned in restaurants around the world, they remain popular in many countries. Increased tobacco use in some countries, including India, has been linked with identification with western influences as opposed to more traditional values (Stigler & others, 2010). As for coffee, caffeine is the most popular psychoactive drug in the world.



Jiro Ose/Redux

TABLE 4.4

Common Sources of Caffeine

Item	Milligrams Caffeine
Coffee (short, 8 ounces)	85–250
Coffee (grande, 16 ounces)	220–550
Tea (8 ounces)	16–60
Chocolate (semisweet, baking; 1 ounce)	25
Soft drinks (12 ounces)	35–70
Energy drinks (8 ounces, Red Bull, Jolt)	40–80
Caffeinated waters (8 ounces, Water Joe, Java Water)	25–60
Over-the-counter stimulants (NoDoz, Vivarin)	200
Over-the-counter analgesics (Anacin, Midol)	25–130
Over-the-counter cold remedies (Triaminicin, Coryban-D)	30

Source: National Sleep Foundation (2004).

stop their caffeine intake. Headaches, irritability, drowsiness, and fatigue can last a week or longer (Juliano & Griffiths, 2004; Reissig & others, 2009).

Taken to excess, caffeine can produce anxiety, restlessness, and increased heart rate, and can disrupt normal sleep patterns. Excessive caffeine use can also contribute to the incidence of sleep disorders, including the NREM parasomnias, like sleepwalking (Cartwright, 2004). Recall that Scott, whose story we told in the Prologue, had been taking caffeine pills for several weeks before his sleepwalking episode. Because Scott never drank coffee or other caffeinated beverages, his caffeine tolerance would have been low. Especially when combined with sleep deprivation, irregular sleep schedules, and high levels of stress—all of which Scott experienced—excessive caffeine intake can trigger sleepwalking and other NREM parasomnias. At least one sleep expert believes that Scott's high caffeine use may have contributed to his outburst of sleep violence (Cartwright, 2007).

For many people, a cup of coffee and a cigarette go hand in hand. Cigarettes contain **nicotine,** another potent and addictive stimulant. Nicotine is found in all tobacco products.

Like coffee, nicotine increases mental alertness and reduces fatigue or drowsiness. Brain-imaging studies show that nicotine increases neural activity in many brain areas, including the frontal lobes, thalamus, hippocampus, and amygdala (Rose & others, 2003). Thus, it's not surprising that smokers report that tobacco enhances mood, attention, arousal, and vigilance.

When cigarette smoke is inhaled, nicotine reaches the brain in seconds. But over the next hour or two, nicotine's desired effects diminish. For the addicted person, smoking becomes a finely tuned and regulated behavior that maintains steady brain levels of nicotine. At regular intervals ranging from about 30 to 90 minutes, the smoker lights up, avoiding the withdrawal effects that are starting to occur. For the pack-a-day smoker, that averages out to some 70,000 "hits" of nicotine every year.

People who start smoking for nicotine's stimulating properties often continue smoking to avoid the withdrawal symptoms. Along with an intense craving for cigarettes, withdrawal symptoms include jumpiness, irritability, tremors, headaches, drowsiness, "brain fog," and light-headedness.

Amphetamines and Cocaine

Like caffeine and nicotine, amphetamines and cocaine are addictive substances that stimulate brain activity, increasing mental alertness and reducing fatigue. However, amphetamines and cocaine also elevate mood and produce a sense of euphoria. When abused, both drugs can produce severe psychological and physical problems.

Sometimes called "speed" or "uppers," **amphetamines** suppress appetite and were once widely prescribed as diet pills. Tolerance to the appetite-suppressant effects occurs quickly, so progressive increases in amphetamine dosage are required to maintain the effect. Consequently, amphetamines are rarely prescribed today for weight control.

Using any type of amphetamines for an extended period of time is followed by "crashing"—withdrawal symptoms of fatigue, deep sleep, intense mental depression, and increased appetite. This is another example of a drug rebound effect. Users also become psychologically dependent on the drug for the euphoric state, or "rush," that it produces, especially when injected.

Benzedrine and *dexedrine* are prescription amphetamines. *Methamphetamine,* also known as *meth,* is an illegal drug that can be easily manufactured in home or street laboratories. Providing an intense high that is longer-lasting and less expensive than that of cocaine, methamphetamine use has spread from the western United States to the rest of the country, including small towns in the rural Midwest and South.

Methamphetamine is highly addictive and can cause extensive brain damage and tissue loss, as discussed in the Focus on Neuroscience box titled "How Methamphetamines Erode the Brain" on the next page. Even after months of abstinence, PET scans of former meth users showed significant reductions in the number of dopamine receptors (Volkow & others, 2001a).

- **stimulants** A category of psychoactive drugs that increase brain activity, arouse behavior, and increase mental alertness.
- **caffeine** (kaff-EEN) A stimulant drug found in coffee, tea, cola drinks, chocolate, and many over-the-counter medications.
- **nicotine** A stimulant drug found in tobacco products.
- **amphetamines** (am-FET-uh-meens) A class of stimulant drugs that arouse the central nervous system and suppress appetite.



The Granger Collection

Cocaine Toothache Drops? Prior to 1914, cocaine was legal in the United States and, like the opiates, was widely used as an ingredient in over-the-counter medicines (Jonnes, 1999). From this 1885 advertisement for Cocaine Toothache Drops, it's clear that cocaine was used to treat children as well as adults. Cocaine derivatives, such as novocaine and lidocaine, are still used medically as anesthetics. Cocaine was also part of Coca-Cola's original formula in 1888. It was replaced in 1903 with another stimulant, caffeine. Coca leaves, with the cocaine extracted for medical purposes, are still used for flavoring cola drinks.

Extensive neurological damage, especially to the frontal lobes, adds to the cognitive and social skill deficits that are evident in heavy methamphetamine users (Homer & others, 2008). Depression, emotional instability, and impulsive and violent behavior are also common. Finally, recent research suggests that it may take years for the brain to recover from damage caused by methamphetamine abuse (Bamford & others, 2008).

Cocaine is an illegal stimulant derived from the leaves of the coca plant, which is found in South America. (The coca plant is not the source of cocoa or chocolate, which is made from the beans of the *cacao* tree.) Psychologically, cocaine produces intense euphoria, mental alertness, and self-confidence. These psychological responses occur because cocaine blocks the reuptake of three different neurotransmitters—dopamine, serotonin, and norepinephrine. Blocking reuptake *potentiates* or increases the effects of these neurotransmitters.

The effects of cocaine depend partly on the form in which it is taken. A concentrated form of cocaine, called "crack," is smoked. When smoked or injected, cocaine reaches the brain in seconds and effects peak in about five minutes. If inhaled or "snorted," cocaine takes several minutes to be absorbed through the nasal membranes, and peak blood levels are reached in 30 to 60 minutes.

Chronic cocaine use produces a wide range of psychological disorders. Of particular note, the prolonged use of amphetamines or cocaine can result in **stimulant-induced psychosis,** also called *amphetamine-induced psychosis* or *cocaine-induced psychosis.* Schizophrenia-like symptoms develop, including auditory hallucinations of voices and bizarrely paranoid ideas. In response to imagined threats, the psychotic person can become highly aggressive and dangerous.

Psychedelic Drugs

Mescaline, LSD, and Marijuana

The term **psychedelic drug** was coined in the 1950s to describe a group of drugs that create profound perceptual distortions, alter mood, and affect thinking. *Psychedelic* literally means "mind manifesting."

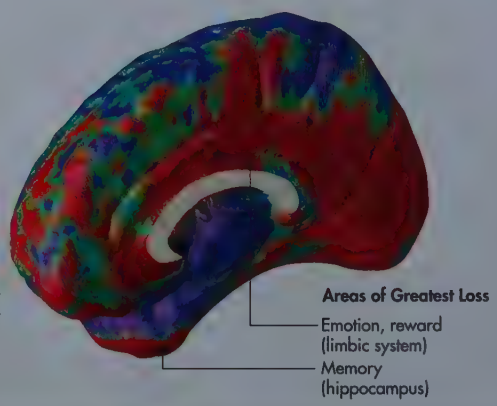
Mescaline and LSD

Naturally occurring psychedelic drugs have been used in religious rituals for thousands of years. **Mescaline** is derived from the peyote cactus. Another psychedelic drug, called *psilocybin,* is derived from *Psilocybe* mushrooms, which are sometimes referred to as "magic mushrooms" or "shrooms."

FOCUS ON NEUROSCIENCE

How Methamphetamines Erode the Brain

Researcher Paul Thompson and his colleagues (2004) used MRI scans to compare the brains of chronic methamphetamine users to those of healthy adults. In the composite scan shown here, red indicates areas with tissue loss from 5 to 10 percent. Green indicates 3 to 5 percent tissue loss, and blue indicates relatively intact brain regions. Thompson found that meth abusers experienced up to 10 percent tissue loss in limbic system areas involved in emotion and reward. Significant tissue loss also occurred in hippocampal regions involved in learning and memory. "We expected some brain changes, but we didn't expect so much brain tissue to be destroyed," Thompson said. Not surprisingly, methamphetamine abusers performed more poorly on memory tests as compared to healthy people the same age (Thompson & others, 2004).



Thompson, Paul M.; Hayashi, Kiralee M.; Simon, Sara L.; Lonkon, Edyth D., et al. (2004). Structural abnormalities in the brains of human subjects who use methamphetamine. *Journal of Neuroscience, 24,* 6028–6036.

In contrast to these naturally occurring psychedelics, **LSD** (*lysergic acid diethylamide*) is a powerful psychedelic drug that was first synthesized in the late 1930s. LSD is far more potent than mescaline or psilocybin. Just 25 micrograms, or one-millionth of an ounce, of LSD can produce profound psychological effects with relatively few physiological changes.

LSD and psilocybin are very similar chemically to the neurotransmitter *serotonin,* which is involved in regulating moods and sensations (see Chapter 2). LSD and psilocybin mimic serotonin in the brain, stimulating serotonin receptor sites in the somatosensory cortex (González-Maeso & others, 2007).



Kai Muller/Woodfin Camp & Associates

Peyote-Inspired Visions The Huichol Indians of Mexico have used peyote in religious ceremonies for hundreds of years. Huichol yarn paintings, like the one shown here, often depict imagery and scenes inspired by traditional peyote visions. These visions resemble the geometric shapes and radiating patterns of hallucinations induced by psychedelic drugs. Today, peyote continues to be used as a sacrament in the religious ceremonies of the Native American Church, a religion with more than 300,000 members (Swan & Big Bow, 1995). According to one study, the use of peyote as a sacrament in the context of church ritual was not associated with either psychological or cognitive problems in Navajo members of the Native American Church (Halpern & others, 2005).

The effects of a psychedelic experience vary greatly, depending on an individual's personality, current emotional state, surroundings, and the other people present. A "bad trip" can produce extreme anxiety, panic, and even psychotic episodes. Tolerance to psychedelic drugs may occur after heavy use. However, even heavy users of LSD do not develop physical dependence, nor do they experience withdrawal symptoms if the drug is not taken.

Adverse reactions to LSD include flashbacks (recurrences of the drug's effects), depression, long-term psychological instability, and prolonged psychotic reactions (Smith & Seymour, 1994). In a psychologically unstable or susceptible person, even a single dose of LSD can precipitate a psychotic reaction.

Marijuana

The common hemp plant, *Cannabis sativa,* is used to make rope and cloth. But when its leaves, stems, flowers, and seeds are dried and crushed, the mixture is called **marijuana,** one of the most widely used illegal drugs. Marijuana's active ingredient is the chemical *tetrahydrocannabinol,* abbreviated *THC.* When marijuana is smoked, THC reaches the brain in less than 30 seconds. One potent form of marijuana, *hashish,* is made from the resin of the hemp plant. Hashish is sometimes eaten.

To lump marijuana with the highly psychedelic drugs mescaline and LSD is somewhat misleading. At high doses, marijuana can sometimes produce sensory distortions that resemble a mild psychedelic experience. Low to moderate doses of THC typically produce a sense of well-being, mild euphoria, and a dreamy state of relaxation. Senses become more focused and sensations more vivid. Taste, touch, and smell may be enhanced; time perception may be altered.

In the early 1990s, researchers discovered receptor sites in the brain that are specific for THC. They also discovered a naturally occurring brain chemical, called *anandamide,* that is structurally similar to THC and that binds to the THC receptors in the brain (Devane & others, 1992). Anandamide appears to be involved in regulating

- **cocaine** A stimulant drug derived from the coca tree.
- **stimulant-induced psychosis** Schizophrenia-like symptoms that can occur as the result of prolonged amphetamine or cocaine use; also called *amphetamine-induced psychosis* or *cocaine-induced psychosis.*
- **psychedelic drugs** (sy-kuh-DEL-ick) A category of psychoactive drugs that create sensory and perceptual distortions, alter mood, and affect thinking.
- **mescaline** (MESS-kuh-*lin*) A psychedelic drug derived from the peyote cactus.
- **LSD** A synthetic psychedelic drug.
- **marijuana** A psychoactive drug derived from the hemp plant.



Jim Wilson/The New York Times/Redux

Medical Marijuana The medical use of marijuana can be traced back for thousands of years to ancient China, Egypt, India, and Greece, among other countries. In 1996 California became the first state to legalize the medical use of marijuana. Now, people with a physician's referral and a state-issued ID card can legally purchase medical-grade marijuana at one of hundreds of California dispensaries, like the San Francisco dispensary shown here. Marijuana can relieve certain types of chronic pain, inflammation, muscle spasms, nausea, vomiting, and other symptoms caused by such illnesses as multiple sclerosis, cancer, and AIDS (see Pisanti & others, 2009; Rahn & Hohmann, 2009). Fifteen other states and the District of Columbia have legalized medical marijuana; similar legislation is pending in several other states.

the transmission of pain signals and may reduce painful sensations. Researchers also suspect that anandamide may be involved in mood and memory.

Marijuana and its active ingredient, THC, have been shown to be helpful in the treatment of pain, epilepsy, hypertension, nausea, glaucoma, and asthma (Piomelli, 2003). In cancer patients, THC can prevent the nausea and vomiting caused by chemotherapy. However, the medical use of marijuana is limited and politically controversial.

On the negative side, marijuana interferes with muscle coordination and perception and may impair driving ability. When marijuana and alcohol use are combined, marijuana's effects are intensified—a dangerous combination for drivers. Marijuana has also been shown to interfere with learning, memory, and cognitive functioning (Harvey & others, 2007). New research suggests that marijuana may interfere with memory and cognition by disrupting communication between the hippocampus and the prefrontal cortex (Kucewicz & other, 2011).

Most marijuana users do not develop physical dependence. Chronic users of high doses can develop some tolerance to THC and may experience withdrawal symptoms when its use is discontinued (Budney & others, 2007; Nocon & others, 2006). Such symptoms include irritability, restlessness, insomnia, tremors, and decreased appetite.



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Rave Culture All-night dance parties, called raves, originated in Great Britain and quickly spread to other European countries and to the United States. Raves may draw anywhere from a few hundred to a few thousand people or more. Highly caffeinated "energy drinks," amphetamines, methamphetamine, and other stimulants may be consumed to maintain the energy needed to dance all night. Rave culture also helped popularize the use of ecstasy, a synthetic drug.

Designer "Club" Drugs

Ecstasy and the Dissociative Anesthetic Drugs

Some drugs don't fit into neat categories. The "club drugs" are a loose collection of psychoactive drugs that are popular at dance clubs, parties, and the all-night dance parties called "raves." Many of these drugs are *designer drugs,* meaning that they were synthesized in a laboratory rather than derived from naturally occurring compounds. In this section, we'll take a look at three of the most popular club drugs—*ecstasy, ketamine,* and *PCP.*

The initials **MDMA** stand for the long chemical name of the quintessential club drug better known as **ecstasy.** At low doses, MDMA acts as a stimulant, but at high doses it has mild psychedelic effects. Its popularity, however, results from its emotional effects: Feelings of euphoria and increased well-being are common. Ecstasy's side effects hint at the problems that can be associated with its use: dehydration, rapid heartbeat, tremors, muscle tension and involuntary teeth-clenching, and hyperthermia (abnormally high body temperature). Rave partygoers who take MDMA in crowded, hot surroundings are particularly at risk for collapse or death from dehydration and hyperthermia.

The "love drug" effects of ecstasy may result from its unique effect on serotonin in the brain. Along with causing neurons to release serotonin, MDMA also blocks serotonin reuptake, amplifying and prolonging serotonin effects (Braun, 2001). While flooding the brain with serotonin may temporarily enhance feelings of emotional well-being, there are adverse trade-offs.

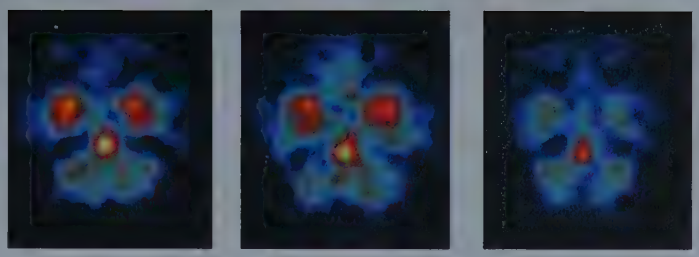
First, the "high" of ecstasy is often followed by depression when the drug wears off. More ominously, studies have shown that moderate or heavy use of ecstasy can damage serotonin nerve endings in the brain (Croft & others, 2001; Reneman & others, 2006). Evidence suggests that female users are more susceptible to brain damage than male users (see Figure 4.7).

Other studies have shown that serotonin levels become severely depleted after long-term use, possibly causing the depression that follows when the drug wears off (Kuhn & Wilson, 2001). Equally troubling are cognitive effects: In one study, memory and verbal reasoning problems persisted up to a year after the last dose was taken (Reneman & others, 2001b). Some research suggests that even occasional use of ecstasy may produce memory problems (Schilt & others, 2007). Several studies have shown that frequent ecstasy users suffer a broad range of cognitive problems, such as impaired memory and decision making (Kalechstein & others, 2007; Montgomery & Fisk, 2008).

Another class of drugs found at dance clubs and raves are the **dissociative anesthetics,** including phencyclidine, better known as *PCP* or *angel dust,* and *ketamine*

MDMA or ecstasy Synthetic club drug that combines stimulant and mild psychedelic effects.

dissociative anesthetics Class of drugs that reduce sensitivity to pain and produce feelings of detachment and dissociation; includes the club drugs phencyclidine (PCP) and ketamine.



Dr. Liesbeth Reneman, Academisch Medisch Centrum, Universiteit van Amsterdam, Amsterdam, Netherlands

(a) Control, Non-use (b) Moderate MDMA use (c) Heavy MDMA use

FIGURE 4.7 Effects of Ecstasy on the Brain The "ecstasy" of an MDMA trip takes a heavy toll on the brain, especially in women (Allott & Redman, 2007). These brain-scan images show serotonin activity (red) in the brains of (a) a normal female volunteer who had never taken ecstasy, (b) a moderate ecstasy user, and (c) a heavy ecstasy user. The study by Dutch scientist Liesbeth Reneman and her colleagues (2001a) included both male and female participants. Reneman found that the female participants were more susceptible to brain damage from ecstasy use than men were.

(street name *Special K*). Rather than producing actual hallucinations, PCP and ketamine produce marked feelings of dissociation and depersonalization. Feelings of detachment from reality—including distortions of space, time, and body image—are common. Generally, PCP has more intense and longer effects than ketamine does.

PCP can be eaten, snorted, or injected, but it is most often smoked. The effects are unpredictable, and a PCP trip can last for several days. Some users of PCP report feelings of invulnerability and exaggerated strength. PCP users can become severely disoriented, violent, aggressive, or suicidal. High doses of PCP can cause hyperthermia, convulsions, and death. PCP affects levels of the neurotransmitter *glutamate,* indirectly stimulating the release of dopamine in the brain. Thus, PCP is highly addictive. Memory problems and depression are common effects of long-term use.

CONCEPT REVIEW 4.4

Psychoactive Drugs

	Drug Class	Example(s)
1. Drugs that create perceptual distortions, alter mood, and affect thinking	_____	_____
2. Drugs that inhibit central nervous system activity; produce drowsiness, sedation, or sleep; and may reduce anxiety and lower inhibitions	_____	_____
3. Synthetic drugs with a variety of effects, often used at dance clubs or raves	_____	_____
4. Addictive drugs that mimic endorphins and relieve pain and produce euphoria	_____	_____
5. Drugs that produce feelings of detachment and depersonalization	_____	_____
6. Addictive drugs that increase brain activity and mental alertness	_____	_____



CLOSING THOUGHTS

Internal biological rhythms and external environmental factors influence the natural ebb and flow of your consciousness over the course of any given day. Beyond those natural oscillations, hypnosis and meditation are techniques that can profoundly alter your experience of consciousness. Meditation, in particular, produces numerous benefits that can help you cope more effectively with life's demands. Some psychoactive drugs, including widely available substances like caffeine, can also influence your experience of consciousness in beneficial ways. But other psychoactive substances, while producing dramatic alterations in consciousness, do so with the potential risk of damaging the finely tuned balance of the brain's neurotransmitters and reward system.



Jeff Scheid/Getty Images

Life in Prison Scott Falater could have received the death penalty after being convicted by a Phoenix jury of first-degree murder in the death of his wife, Yarmila. But during the presentencing investigation, Falater's two children, and even Yarmila's mother, pleaded to spare his life. The sentencing judge agreed, and sentenced Falater to life in prison with no possibility for parole.

Both natural and deliberate factors seem to have played a role in the extreme breach of consciousness that Scott Falater claimed to experience. Severe disruptions in his normal sleep patterns, his out-of-character use of caffeine, and intense work-related stresses combined to trigger sleepwalking, a parasomnia that Scott had demonstrated when he was younger. And that Scott reacted violently when his wife tried to guide him back to bed also had precedent; Scott had reacted aggressively earlier in his life when his sister tried to intervene during one of his sleepwalking episodes.

Scott Falater's trial for murdering his wife drew international attention. In the end, the Arizona jury convicted Falater of first-degree, premeditated murder. Falater was sentenced to life in prison with no possibility of parole. Today, Scott Falater is incarcerated in the Arizona State Prison Complex at Yuma, where he works as an educational aide and library clerk.

stimulus control therapy Insomnia treatment involving specific guidelines to create a strict association between the bedroom and rapid sleep onset.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Stimulus Control Therapy for Insomnia

In this section, we'll provide some simple tips to help you minimize sleep problems. If you frequently suffer from insomnia, we'll also describe a very effective treatment that you can implement on your own—**stimulus control therapy.**

Preventing Sleep Problems

You may not realize the degree to which your daily habits can contribute to or even create sleeping difficulties. The following four strategies can help you consistently get a good night's sleep.

1. Monitor your intake of stimulants.

Many people don't realize how much caffeine they're ingesting. Coffee, tea, soft drinks, chocolate, and many over-the-counter medications contain significant amounts of caffeine (see Table 4.4). Monitor your caffeine intake, and avoid caffeine products for at least 4 hours before going to bed. Some people are very sensitive to caffeine's stimulating effects and may need to avoid caffeine for up to 10 hours before bedtime. Beyond caffeine, some herbal teas and supplements contain ginseng, ephedrine, or other stimulants that can keep you awake.

2. Establish a quiet bedtime routine.

Avoid stimulating mental or physical activity for at least an hour before your bedtime. That means no suspenseful television shows, violent videos, exciting video games, or loud arguments right before bedtime. Ditto for strenuous exercise. Although regular exercise is an excellent way to improve your sleep, exercising within 3 hours of bedtime may keep you awake. Finally, soaking in a very warm bath shortly before bed promotes deep sleep by raising your core body temperature.

3. Create the conditions for restful sleep.

Your bedroom should be quiet, cool, and dark. If you live in a noisy environment, invest in a pair of earplugs or some sort of "white noise" source, such as a fan, for your bedroom. Turn off or mute all devices that can potentially disrupt your sleep, including cell phones and computers.

4. Establish a consistent sleep–wake schedule.

While this is probably the single most effective strategy to achieve high-quality sleep, it's also the most challenging for a lot of college students. Try to go to bed at about the same time each night and get up at approximately the same time every morning so that your circadian rhythms stay in sync. Exposure to bright lights or sunlight shortly after awakening in the morning helps keep your internal clock set.

Many students try to "catch up" on their sleep by sleeping in on the weekends. Unfortunately, this strategy can work against you by producing a case of the "Monday morning blues," which is a self-induced case of jet lag caused by resetting your circadian rhythms to the later weekend schedule.

If you've tried all these suggestions and are still troubled by frequent insomnia, you may need to take a more systematic approach, as outlined in the next section.

Stimulus Control Therapy

Without realizing it, you can sabotage your ability to sleep by associating mentally arousing activities and stimuli with your bedroom, such as watching TV, text messaging, reading, surfing the Internet, eating, listening to music, doing homework or paperwork, and so on. Over time, your bed and bedroom become stimuli that trigger arousal rather than drowsiness and the rapid onset of sleep. In turn, this increases the amount of time that you're lying in bed awake, thrashing around, and trying to force yourself to sleep.

Stimulus control therapy is designed to help you (a) establish a consistent sleep–wake schedule and (b) associate your bedroom and bedtime with falling asleep rather than other activities (Morin & others, 2006). To achieve improved sleep, you must commit to the following rules with *no* exceptions for at least two weeks:

- Only sleep and sex are allowed in your bedroom. None of the sleep-incompatible activities mentioned above are allowed in your bed or bedroom.

- Only go to bed when you are sleepy, not tired or wiped out, but *sleepy.*
- Once in bed, if you're still awake after 15 minutes, don't try to force yourself to go to sleep. Instead, get out of bed and go sit in another room. Only go back to bed when you get sleepy.
- Get up at the *same* time *every* morning, including weekends, regardless of how much sleep you got the night before.
- No daytime napping. None. Zip. Nada. Zilch.

Strictly adhering to these rules can be challenging given the realities of work, family, school, and other personal commitments. However, those situations are much easier to manage when you are adequately rested.

Keeping a *sleep diary* can help you track your sleep and sleep-related behaviors. It will also increase your awareness of your sleep habits and the factors that interfere with restorative sleep. The National Sleep Foundation has a diary available as a downloadable PDF. Other sleep diaries can easily be found with an Internet search. Sleep well!



CHAPTER REVIEW

Consciousness and Its Variations

KEY POINTS

Introduction: Consciousness: *Experiencing the "Private I"*

- **Consciousness** refers to your immediate awareness of mental activity, internal sensations, and external stimuli. Most psychologists today consider consciousness an important area of research, as did early psychologists.

Biological and Environmental "Clocks" That Regulate Consciousness

- **Circadian rhythms** are regulated by the **suprachiasmatic nucleus (SCN),** the "master clock" located in the hypothalamus of the brain. In response to light detected by special photoreceptors, the SCN reduces the production of **melatonin** by the pineal gland. Increased melatonin makes you sleepy.
- In the absence of environmental time cues like sunlight, human circadian rhythms drift toward a 24.2-hour day. Circadian rhythms become disrupted when environmental time cues are out of sync with the body clock. Symptoms of jet lag can be produced by travel across time zones or by rotating shift work.

Sleep

- The invention of the **electroencephalograph,** which produces an **EEG** or **electroencephalogram,** and the discovery of rapid eye movements (REM) changed scientific views about sleep. The two basic types of sleep are **REM sleep** and **NREM sleep.**
- When we are awake and alert, the brain generates **beta brain waves.** As brain activity gears down and drowsiness sets in, **alpha brain waves** are generated. **Hypnagogic hallucinations** can occur during this drowsy, presleep phase.
- Each sleep stage is characterized by a specific pattern of brain activity. In the first 90 minutes of sleep, four different stages of NREM sleep are followed by a brief episode of REM sleep. Stage 2 of sleep is defined by the appearance of **sleep spindles** and **K complexes.** Throughout the night, episodes of REM sleep become progressively longer and NREM episodes become shorter.
- As people age, periods of REM sleep and deep sleep become shorter, and more sleep time is spent in stage 2 NREM.
- Sleep is important to maintaining immune function, in learning and memory, mood regulation, and other physiological processes. Sleep patterns vary among species and may be the result of evolutionary adaptation. Sleep deprivation studies and the phenomenon of **REM rebound** demonstrate the biological need to sleep.

Dreams and Mental Activity During Sleep

- **Sleep thinking** occurs during NREM sleep. A **dream** is a story-like, unfolding episode of mental images that typically occurs during REM sleep but can also occur during NREM.
- During REM sleep, the brain is cut off from external stimuli. The frontal lobes and primary visual cortex are inactivated, but the hippocampus, amygdala, and other visual centers are highly active. REM sleep is needed for the consolidation of certain types of memories.
- Most dreams reflect everyday concerns and include familiar people and settings. Changes in brain chemistry and functioning that occur during sleep probably contribute to the inability to remember dreams. There are individual differences in dream recall. **Nightmares** are unpleasant anxiety dreams.
- Sigmund Freud believed that dream images are symbols of unconscious wishes. According to Freud, dreams are composed of **manifest content** and **latent content.** The **activation–synthesis model of dreaming** proposes that dreams reflect our subjective awareness of brain activation during sleep. According to the **neurocognitive model of dreaming,** dreaming cognition is similar to waking cognition.

Sleep Disorders

- **Sleep disorders** are serious disturbances in the normal sleep pattern that interfere with daytime functioning and cause subjective distress.
- **Dyssomnias,** such as **insomnia** and **obstructive sleep apnea (OSA),** involve interruptions in the amount, quality, or timing of sleep. The symptoms of **narcolepsy,** including **cataplexy,** are experienced during the day. Narcolepsy may be associated with low levels of **hypocretins. Parasomnias** involve undesirable physical arousal, behavior, or events during sleep or sleep transitions; examples include **sleepwalking, sleep terrors, sleep-related eating disorder, sleepsex,** and **REM sleep behavior disorder.**

Hypnosis

- **Hypnosis** is an unusual state of awareness, defined as a cooperative social interaction in which the hypnotic participant responds to suggestions made by the hypnotist. Changes in perception, memory, and behavior may be produced. People vary in hypnotic susceptibility.

- Under hypnosis, profound sensory and perceptual changes may be experienced, including pain reduction and hallucinations. **Posthypnotic suggestions** influence behavior outside the hypnotic state. Hypnosis is used in habit control, but its effectiveness varies. Hypnosis can produce **posthypnotic amnesia,** but not **hypermnesia.** Although hypnosis does not increase the accuracy of memories, it does increase confidence in memories and can produce false memories. Hypnosis cannot be used to make people perform behaviors that are contrary to their morals or values.
- The **neodissociation theory** of Ernest Hilgard explains hypnosis as involving **dissociation** and a **hidden observer.** Some psychologists believe that hypnosis is not a special state of consciousness but can be explained by social and cognitive processes.

Meditation

- **Meditation** techniques induce a state of focused attention and heightened awareness. Two forms of meditation are focused awareness and open monitoring.
- Early research on meditation emphasized stress relief and relaxation. Research today studies meditation's effects on the brain and basic psychological processes, including attention, memory, cognition, and emotion. Meditation techniques are also used in psychotherapy.

Psychoactive Drugs

- **Psychoactive drugs** can alter arousal, mood, thinking, sensation, and perception. Many psychoactive drugs are addictive, producing **physical dependence** and **drug tolerance.** The physically dependent person who stops taking a drug experiences **withdrawal symptoms,** which often include the **drug rebound effect.**
- Psychoactive drugs affect brain activity by influencing synaptic transmission. Drug effects can be influenced by the person's weight, gender, race, metabolic rate, and the presence of other drugs. Personality characteristics, mood, expectations, experience with the drug, and the setting in which the drug is taken also affect the drug response.
- **Drug abuse** refers to recurrent drug use that leads to disruptions in academic, social, or occupational functioning and to legal or psychological problems.
- **Depressants** are physically addictive drugs that inhibit central nervous system activity. Depressants include alcohol, **barbiturates, inhalants,** and **tranquilizers.** Psychologically, alcohol lessens inhibitions, but its effects vary, depending on the person's environment and expectations. Barbiturates and inhalants produce relaxation and reduce inhibitions.
- **Opiates** are addictive drugs that relieve pain and produce feelings of euphoria. The opiates include opium, morphine, codeine, heroin, methadone, and prescription painkillers. Opiates relieve pain by mimicking the effect of endorphins in the brain.
- **Stimulants** include **caffeine, nicotine, amphetamines,** and **cocaine.** The stimulants increase brain activity, and all stimulants are addictive. Prolonged use of amphetamines or cocaine can lead to **stimulant-induced psychosis.**
- **Psychedelic drugs** include **mescaline, LSD,** and **marijuana.** The psychedelics create perceptual distortions, alter mood, and affect thinking. Although psychedelic drugs are not physically addictive, they can cause a variety of harmful effects.
- The "club drugs" are synthetic drugs used at dance clubs, parties, and "raves." These drugs include **MDMA (ecstasy)** and the **dissociative anesthetics** PCP and ketamine.

KEY TERMS

consciousness, p. 134
attention, p. 135
circadian rhythm, p. 137
suprachiasmatic nucleus (SCN), p. 138
melatonin, p. 138
electroencephalograph, p. 140
EEG (electroencephalogram), p. 140
REM sleep, p. 140
NREM sleep, p. 140
sleep paralysis, p. 141
beta brain waves, p. 142
alpha brain waves, p. 142
hypnagogic hallucinations, p. 142
sleep spindles, p. 143
K complex, p. 143
REM rebound, p. 147
sleep thinking, p. 148
dream, p. 148
nightmare, p. 151
manifest content, p. 151
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narcolepsy, p. 156
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sleepsex, p. 157
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hidden observer, p. 161
meditation, p. 163
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tranquilizers, p. 171
opiates, p. 171
stimulants, p. 172
caffeine, p. 172
nicotine, p. 173
amphetamines, p. 173
cocaine, p. 174
stimulant-induced psychosis, p. 174
psychedelic drugs, p. 174
mescaline, p. 174
LSD, p. 175
marijuana, p. 175
MDMA (ecstasy), p. 176
dissociative anesthetics, p. 176
stimulus control therapy, p. 178

KEY PEOPLE

Sigmund Freud (1856–1939) Austrian physician and founder of psychoanalysis; proposed that dream images are disguised and symbolic expressions of unconscious wishes and urges. (p. 151)

Ernest R. Hilgard (1904–2001) American psychologist who extensively studied hypnosis and advanced the *neodissociation theory of hypnosis.* (p. 161)

Robert W. McCarley (b. 1937) Contemporary American psychiatrist and neuroscientist who has extensively studied the brain controls involved in sleep and dreaming; along with co-researcher J. Allan Hobson, proposed the *activation–synthesis model of dreaming.* (p. 152)

J. Allan Hobson (b. 1933) Contemporary American psychiatrist and neuroscientist who has extensively studied the neuropsychological events associated with sleep and dreaming; along with co-researcher Robert W. McCarley, proposed the *activation–synthesis model of dreaming.* (p. 152)

William James (1842–1910) American psychologist and philosopher who proposed that the subjective experience of consciousness is not episodic, but an ongoing stream of mental activity. (p. 135)

CONCEPT REVIEW ANSWERS

4.1 page 147

1. 24.2
2. suprachiasmatic nucleus (or SCN); sunlight; circadian rhythms
3. stage 2 NREM
4. slow-wave sleep (SWS) or REM
5. stage 4 NREM or slow-wave sleep (SWS)

4.2 page 158

1. a 2. d 3. d 4. b 5. c

4.3 page 166

1. a 2. d 3. a 4. d

4.4 page 177

1. psychedelic drugs: LSD, mescaline, marijuana
2. depressants: alcohol, barbiturates, tranquilizers, inhalants
3. club drugs: ecstasy (MDMA)
4. opiates: opium, morphine, heroin, methadone, Demerol, Percodan, OxyContin
5. dissociative anesthetics: PCP, ketamine
6. stimulants: caffeine, nicotine, amphetamines, methamphetamines, cocaine

SOLUTION TO FIGURE 4.1

Figure 4.1: Can We Read Your Mind? Explanation: Look once more at the six cards on page 136, and then compare them with the five cards pictured on page 138. Notice any differences? If the act of circling an eye distracted you and you fell for the trick—as most people do—you have just experienced *change blindness.*



Web Companion Review Activities

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The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.





CHAPTER 5

Learning







The Killer Attic

PROLOGUE

SANDY'S PARENTS, ERV AND FERN, were married for more than 50 years.

Sometimes it seems truly amazing that they managed to stay together for so long, as you'll see from this true story.

It was a warm summer morning in Chicago. Erv and Fern drank their coffee and made plans for the day. The lawn needed mowing, the garage needed cleaning, and someone had to go to the post office to buy stamps. Fern, who didn't like driving, said that she would mow the lawn if Erv would go to the post office. Erv, who didn't like yard work, readily agreed to the deal.

As Erv left for the post office, Fern started cutting the grass in the backyard. When Erv returned, he parked the car around the corner under some large shade trees so that it would stay cool while he puttered around in the garage. Walking through the front door to drop off the stamps, he noticed that the attic fan was squeaking loudly. Switching it off, Erv decided to oil the fan before he tackled the garage. He retrieved the stepladder and oil from the basement, propped the ladder under the attic's trapdoor, and gingerly crawled up into the attic, leaving the trapdoor open.

Meanwhile, Fern was getting thirsty. As she walked past the garage on the way into the house, she noticed the car was still gone. "Why isn't Erv back yet? He must have stopped somewhere on the way back from the post office," she thought. As she got a glass of water, she noticed the stepladder and the open attic door. Muttering that Erv never put anything away, Fern latched the trapdoor shut and dragged the ladder back down to the basement.

Erv, who had crawled to the other side of the attic to oil the fan, never heard the attic trapdoor shut. It was very hot in the well-insulated, airless attic, so he tried to work fast. After oiling the fan, he crawled back to the trapdoor—only to discover that it was latched shut from the outside! "Fern," he hollered, "open the door!" But Fern was already back outside, mowing away, and couldn't hear Erv over the noise of the lawn mower. Erv, dripping with sweat, kept yelling and pounding on the trapdoor.

Outside, Fern was getting hot, too. She stopped to talk to a neighbor, leaving the lawn mower idling. He offered Fern a cold beer, and the two of them leaned over the fence, laughing and talking. From a small, sealed attic window, Erv watched the whole scene. Jealousy was now added to his list of discomforts. He was also seriously beginning to think that he might sweat to death in the attic heat. He could already see the tabloid headlines in the supermarket checkout line: LAUGHING WIFE DRINKS BEER WHILE HUSBAND COOKS IN ATTIC!

IN THIS CHAPTER:

- Introduction: What Is Learning?
- Classical Conditioning: Associating Stimuli
- Contemporary Views of Classical Conditioning
- Operant Conditioning: Associating Behaviors and Consequences
- Contemporary Views of Operant Conditioning
- Observational Learning: Imitating the Actions of Others
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Using Learning Principles to Improve Self-Control

Finally, Fern went back to mowing, wondering what in the world had happened to Erv. Meanwhile, up in the attic, Erv was drenched with sweat and his heart was racing. He promised God he'd never complain about Chicago winters again. At last, Fern finished the lawn and walked back to the house. Hearing the back door open, Erv began to yell and pound on the trapdoor again.

"Hey, Fern! Fern!"

Fern froze in her tracks.

"Fern, let me out! I'm going to suffocate up here!"

"Erv! Is that you? Where are you?" she called, looking around.

"I'm in the attic! Let me out!"

"What are you doing in the attic? I thought you were at the store!"

"What do you *think* I'm doing? Let me out of here! Hurry!"

Once Fern was reassured that Erv had suffered no ill effects from being trapped in the attic, she burst out laughing. Later that day, still grumbling about Fern's harebrained sense of humor, Erv removed the latch from the attic door and replaced it with a handle. Ever since, whenever Erv went up into the attic, he posted a sign on the ladder that read MAN IN THE ATTIC! In fact, for years afterward, Erv got nervous whenever he had to go up into the attic.

For her part, Fern began carefully checking on Erv's whereabouts before closing the attic door. But she still laughs when she tells the story of the "killer attic"—which she does frequently, as it never fails to crack up her listeners. Luckily, Erv was a good sport and was used to Fern's sense of humor.

Erv and Fern both learned from their experience, as is reflected in the changes in their behavior. Learning new behaviors can occur in many ways, but it almost always helps us adapt to changing circumstances, as you'll see in this chapter.

Introduction: What Is Learning?

KEY THEME

› Learning refers to a relatively enduring change in behavior or knowledge as a result of experience.

KEY QUESTIONS

› What is conditioning?

› What are three basic types of learning?



Rick D'Elia/Corbis

Conditioning, Learning, and Behavior Through different kinds of experiences, people and animals acquire enduring changes in their behaviors. Psychologists have identified general principles of learning that explain how we acquire new behaviors. These principles apply to simple responses, but they can also help explain how we learn complex skills, like the traditional style of drumming that these children are learning in an after-school class in Bungwe, Rwanda.

What do we mean when we say that Fern and Erv have "learned" from their experience with the killer attic? In the everyday sense, *learning* often refers to formal methods of acquiring new knowledge or skills, such as learning in the classroom or learning to play the flute.

In psychology, however, the topic of learning is much broader. In general, psychologists formally define **learning** as a process that produces a relatively enduring change in behavior or knowledge as a result of an individual's experience. For example, Erv has learned to feel anxious and uncomfortable whenever he needs to enter the attic. He's also learned to take simple precautions, such as posting his MAN IN THE ATTIC! sign, to avoid getting locked in the attic again. As Erv's behavior demonstrates, the learning of new behaviors often reflects adapting to your environment. As the result of experience, you acquire new behaviors or modify old behaviors so as to better cope with your surroundings.

In this broad sense of the word, learning occurs in every setting, not just in classrooms. And learning takes place at every age. Further, the psychological study of learning is not limited to humans. From alligators to zebras, learning is an important aspect of the behavior of virtually all animals.

Psychologists have often studied learning by observing and recording the learning experiences of animals in carefully controlled laboratory situations. Using animal subjects, researchers can precisely control the conditions under which a particular behavior is learned. The goal of much of this research has been to identify the general principles of learning that apply across a wide range of species, including humans.

Much of this chapter will focus on a very basic form of learning, called *conditioning*. **Conditioning** is the process of learning associations between environmental events

and behavioral responses. This description may make you think conditioning has only a limited application to your life. In fact, however, conditioning is reflected in most of your everyday behavior, from simple habits to emotional reactions and complex skills.

In this chapter, we'll look at basic types of conditioning—classical conditioning and operant conditioning. As you'll see in the next section, *classical conditioning* explains how certain stimuli can trigger an automatic response, as the attic now triggers mild anxiety in Erv. And, as you'll see in a later section, *operant conditioning* is useful in understanding how we acquire new, voluntary actions, such as Erv's posting his sign whenever he climbs into the attic. Finally, toward the end of the chapter, we'll consider the process of *observational learning*, or how we acquire new behaviors by observing the actions of others.

learning A process that produces a relatively enduring change in behavior or knowledge as a result of past experience.

conditioning The process of learning associations between environmental events and behavioral responses.

Classical Conditioning

Associating Stimuli

KEY THEME

› Classical conditioning is a process of learning associations between stimuli.

KEY QUESTIONS

› How did Pavlov discover and investigate classical conditioning?

› How does classical conditioning occur?

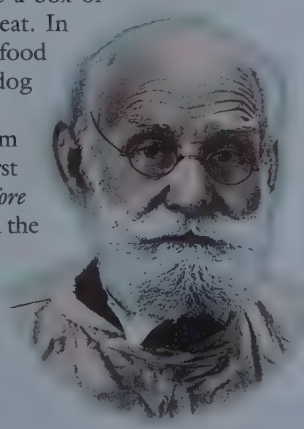
› What factors can affect classical conditioning?

One of the major contributors to the study of learning was not a psychologist but a Russian physiologist who was awarded a Nobel Prize for his work on digestion (Miyata, 2009). **Ivan Pavlov** was a brilliant scientist who directed several research laboratories in St. Petersburg, Russia, at the turn of the twentieth century. Pavlov's involvement with psychology began as a result of an observation he made while investigating the role of saliva in digestion, using dogs as his experimental subjects.

In order to get a dog to produce saliva, Pavlov (1904) put food on the dog's tongue. After he had worked with the same dog for several days in a row, Pavlov noticed something curious. The dog began salivating *before* Pavlov put the food on its tongue. In fact, the dog began salivating when Pavlov entered the room or even at the sound of his approaching footsteps. But salivating is a *reflex*—a largely involuntary, automatic response to an external stimulus. (As we've noted in previous chapters, a *stimulus* is anything perceptible to the senses, such as a sight, sound, smell, touch, or taste.) The dog should salivate only *after* the food is presented, not before. Why would the reflex occur before the stimulus was presented? What was causing this unexpected behavior?

If you own a dog, you've probably observed the same basic phenomenon. Your dog gets excited and begins to slobber when you shake a box of dog biscuits, even before you've given him a doggie treat. In everyday language, your pet has learned to anticipate food in association with some signal—namely, the sound of dog biscuits rattling in a box.

Pavlov's extraordinary gifts as a researcher enabled him to recognize the important implications of what had at first seemed a problem—a reflex (salivation) that occurred *before* the appropriate stimulus (food) was presented. He also had the discipline to systematically study how such associations are formed. In fact, Pavlov abandoned his research on digestion and devoted the remaining 30 years of his life to investigating different aspects of this phenomenon. Let's look at what he discovered in more detail.



Ivan Pavlov (1849–1936) In his laboratory, Pavlov was known for his meticulous organization, keen memory, and attention to details (Windholz, 1990). But outside his lab, Pavlov was absentminded, forgetful, and impractical, especially regarding money. He often forgot to pick up his paycheck, and he sometimes lent money to people with hard luck stories who couldn't possibly pay him back (Fancher, 1996). On a trip to New York City, Pavlov carried his money so carelessly that he had his pocket picked in the subway, and his American hosts had to take up a collection to pay his expenses (Skinner, 1966).

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Life in Pavlov's Laboratories

During Pavlov's four decades of research, more than 140 scientists and students worked in the two laboratories under his direction. Twenty of his co-researchers were women, including his daughter, V. I. Pavlova. Pavlov, who had an extraordinary memory for details, carefully supervised the procedures of dozens of ongoing research projects. Nevertheless, he acknowledged that the scholarly achievements produced by his laboratories represented the collective effort of himself and his co-workers (Windholz, 1990).

Principles of Classical Conditioning

The process of conditioning that Pavlov discovered was the first to be extensively studied in psychology. Thus, it's called *classical conditioning* (Hilgard & Marquis, 1940). **Classical conditioning** deals with behaviors that are elicited automatically by some stimulus. *Elicit* means "draw out" or "bring forth." That is, the stimulus doesn't produce a new behavior but rather *causes an existing behavior to occur.*

Classical conditioning almost always involves some kind of reflexive behavior. Remember, a reflex is a relatively simple, unlearned behavior, governed by the nervous system, that occurs *automatically* when the appropriate stimulus is presented. In Pavlov's (1904) original studies of digestion, the dogs salivated reflexively when food was placed on their tongues. But when the dogs began salivating in response to the sight of Pavlov or to the sound of his footsteps, a new, *learned* stimulus elicited the salivary response. Thus, in classical conditioning, a *new* stimulus–response sequence is learned.

How does this kind of learning take place? Essentially, classical conditioning is a process of learning an *association between two stimuli.* Classical conditioning involves pairing a *neutral* stimulus (e.g., the sight of Pavlov) with an *unlearned, natural* stimulus (food in the mouth) that automatically elicits a reflexive response (the dog salivates). If the two stimuli (Pavlov + food) are repeatedly paired, eventually the neutral stimulus (Pavlov) elicits the same basic reflexive response as the natural stimulus (food)—even in the absence of the natural stimulus. So, when the dog in the laboratory started salivating at the sight of Pavlov *before* the food was placed on its tongue, it was because the dog had formed a new, *learned association* between the sight of Pavlov and the food.

Pavlov used special terms to describe each element of the classical conditioning process. The natural stimulus that reflexively produces a response without prior learning is called the **unconditioned stimulus** (abbreviated **UCS**). In this example, the unconditioned stimulus is the food in the dog's mouth. The unlearned, reflexive response is called the **unconditioned response** (or **UCR**). The unconditioned response is the dog's salivation.

To learn more about his discovery, Pavlov (1927) controlled the stimuli that preceded the presentation of food. For example, in one set of experiments, he used a bell as a neutral stimulus—neutral because dogs don't normally salivate to the sound of a ringing bell. Pavlov first rang the bell and then gave the dog food. After this procedure was repeated several times, the dog began to salivate when the bell was rung, before the food was put in its mouth. At that point, the dog was *classically conditioned* to salivate to the sound of a bell alone. That is, the dog had *learned a new association* between the sound of the bell and the presentation of food.

Pavlov called the sound of the bell the *conditioned stimulus.* The **conditioned stimulus** (or **CS**) is the stimulus that is originally neutral but comes to elicit a reflexive response. He called the dog's salivation to the sound of the bell the **conditioned response** (or **CR**), which is the *learned* reflexive response to a previously neutral stimulus. The steps of Pavlov's conditioning process are outlined in Figure 5.1.

Classical conditioning terminology can be confusing. You may find it helpful to think of the word *conditioned* as having the same meaning as "learned." Thus, the "conditioned stimulus" refers to the "learned stimulus," the "unconditioned response" refers to the "unlearned response," and so forth.

It's also important to note that, in this case, the unconditioned response and the conditioned response describe essentially the same behavior—the dog's salivating. Which label is applied depends on which stimulus elicits the response. If the dog is salivating in response to a *natural* stimulus that was not acquired through learning, the salivation is an *unconditioned* response. If, however, the dog has learned to salivate to a *neutral* stimulus that doesn't normally produce the automatic response, the salivation is a *conditioned* response.



Bizzaro cartoon. Copyright 12/30/02 Kings Features Syndicate

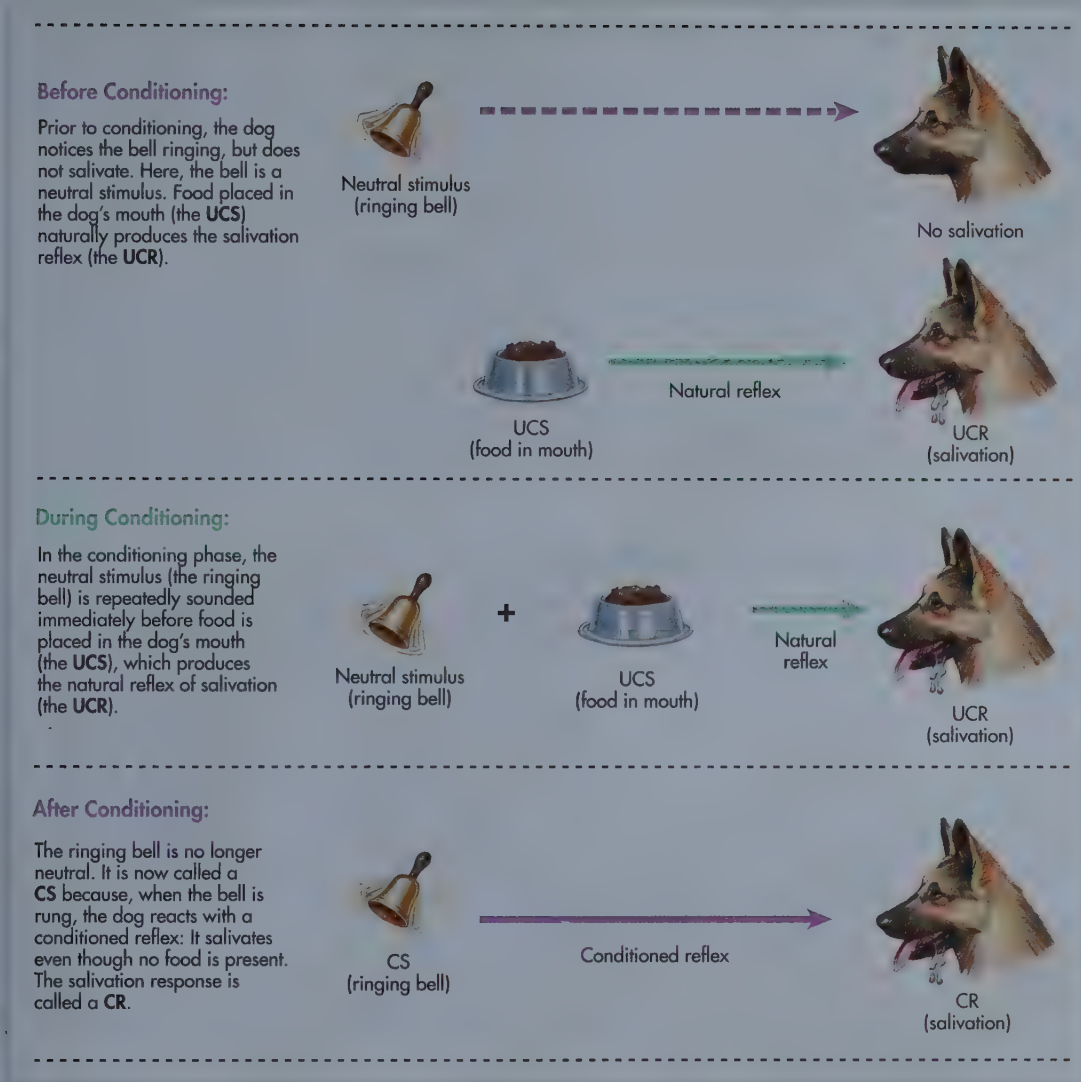


FIGURE 5.1
The Process of Classical Conditioning
The diagram shows Pavlov's classical conditioning procedure. As you can see, classical conditioning involves the learning of an association between a neutral stimulus (the ringing bell) and a natural stimulus (food).

Factors That Affect Conditioning

Over the three decades that Pavlov (1928) spent studying classical conditioning, he discovered many factors that could affect the strength of the conditioned response (Bitterman, 2006). For example, he discovered that the more frequently the conditioned stimulus and the unconditioned stimulus were paired, the stronger was the association between the two.

Pavlov also discovered that the *timing* of stimulus presentations affected the strength of the conditioned response. He found that conditioning was most effective when the conditioned stimulus was presented immediately *before* the unconditioned stimulus. In his early studies, Pavlov found that a half-second was the optimal time interval between the onset of the conditioned stimulus and the beginning of the unconditioned stimulus. Later, Pavlov and other researchers found that the optimal time interval could vary in different conditioning situations but was rarely more than a few seconds.

Stimulus Generalization and Discrimination

Pavlov (1927) noticed that once a dog was conditioned to salivate to a particular stimulus, new stimuli that were similar to the original conditioned stimulus could also elicit the conditioned salivary response. For example, Pavlov conditioned a dog to

- **classical conditioning** The basic learning process that involves repeatedly pairing a neutral stimulus with a response-producing stimulus until the neutral stimulus elicits the same response.
- **unconditioned stimulus (UCS)** The natural stimulus that reflexively elicits a response without the need for prior learning.
- **unconditioned response (UCR)** The unlearned, reflexive response that is elicited by an unconditioned stimulus.
- **conditioned stimulus (CS)** A formerly neutral stimulus that acquires the capacity to elicit a reflexive response.
- **conditioned response (CR)** The learned, reflexive response to a conditioned stimulus.

stimulus generalization The occurrence of a learned response not only to the original stimulus but to other, similar stimuli as well.

stimulus discrimination The occurrence of a learned response to a specific stimulus but not to other, similar stimuli.

higher order conditioning (also called *second-order conditioning*) A procedure in which a conditioned stimulus from one learning trial functions as the unconditioned stimulus in a new conditioning trial; the second conditioned stimulus comes to elicit the conditioned response, even though it has never been directly paired with the unconditioned stimulus.

salivate to a low-pitched tone. When he sounded a slightly higher-pitched tone, the conditioned salivary response would also be elicited. Pavlov called this phenomenon *stimulus generalization*. **Stimulus generalization** occurs when stimuli that are similar to the original conditioned stimulus also elicit the conditioned response, even though they have never been paired with the unconditioned stimulus. If you own a dog that tends to salivate and get excited when you shake a box of dog biscuits, you may have noticed that your dog also drools when you shake a bag of cat food. If so, that would be an example of stimulus generalization.

Just as a dog can learn to respond to similar stimuli, so it can learn the opposite—to *distinguish* between similar stimuli. For example, Pavlov repeatedly gave a dog some food following a high-pitched tone but did not give the dog any food following a low-pitched tone. The dog learned to distinguish between the two tones, salivating to the high-pitched tone but not to the low-pitched tone. This phenomenon, **stimulus discrimination,** occurs when a particular conditioned response is made to one stimulus but not to other, similar stimuli. So, if your dog eventually stops salivating when you shake a bag of cat food, stimulus discrimination has taken place.

Higher Order Conditioning

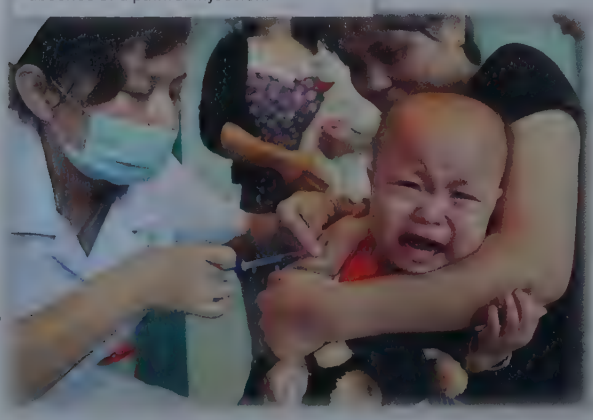
In further studies of his classical conditioning procedure, Pavlov (1927) found that a conditioned stimulus could itself function as an unconditioned stimulus in a new conditioning trial. This phenomenon is called **higher order conditioning** or *second-order conditioning*. Pavlov paired a ticking metronome with food until the sound of the ticking metronome became established as a conditioned stimulus. Then Pavlov repeatedly paired a new unconditioned stimulus, a black square, with the ticking metronome—but no food. After several pairings, would the black square alone produce salivation? It did, even though the black square had never been directly paired with food. The black square had become a *new* conditioned stimulus, simply by being repeatedly paired with the first conditioned stimulus: the ticking metronome. Like the first conditioned stimulus, the black square produced the conditioned response: salivation.

It is important to note that in higher order conditioning, the new conditioned stimulus has *never* been paired with the unconditioned stimulus. The new conditioned stimulus acquires its ability to produce the conditioned response by virtue of being paired with the first conditioned stimulus (Hussaini & others, 2007; Jara & others, 2006).

Consider this example: Like most children, our daughter, Laura, received several rounds of immunizations when she was an infant. Each painful injection (the UCS) elicited distress and made her cry (the UCR). After only the *second* vaccination, Laura developed a strong classically conditioned response—just the sight of a nurse's white uniform (the CS) triggered an emotional outburst of fear and crying (the CR). Interestingly, Laura's conditioned fear generalized to a wide range of white uniforms, including a pharmacist's white smock, a veterinarian's white lab coat, and even the white jacket of a cosmetics saleswoman in a department store.

To illustrate higher order conditioning, imagine that baby Laura reacted fearfully when she saw a white-jacketed cosmetics saleswoman in a department store. Imagine further that the saleswoman compounded Laura's reaction by spraying her mother, Sandy, with a new perfume fragrance and handing Sandy a free perfume sample to take home. If Laura responded with fear the next time she smelled the fragrance, higher order conditioning would have taken place. The perfume scent had never been paired with the original UCS, the painful injection. The scent became a new CS by virtue of being paired with the first CS, the white jacket.

Classical Conditioning in Early Life: White Coats and Doctor Visits Most infants receive several vaccinations in their first few years of life. The painful injection (a UCS) elicits fear and distress (a UCR). After a few office visits, the clinic, nurse, or even the medical staff's white lab coats can become a conditioned stimulus (CS) that elicits fear and distress—even in the absence of a painful injection.



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Extinction and Spontaneous Recovery

Once learned, can conditioned responses be eliminated? Pavlov (1927) found that conditioned responses could be gradually weakened. If the conditioned stimulus (the ringing bell) was repeatedly presented *without* being paired with the unconditioned stimulus (the food), the conditioned response seemed to gradually disappear. Pavlov called this process of decline and eventual disappearance of the conditioned response **extinction.**

Pavlov also found that the dog did not simply return to its unconditioned state following extinction (see Figure 5.2). If the animal was allowed a period of rest (such as a few hours) after the response was extinguished, the conditioned response would reappear when the conditioned stimulus was again presented. This reappearance of a previously extinguished conditioned response after a period of time without exposure to the conditioned stimulus is called **spontaneous recovery.** The phenomenon of spontaneous recovery demonstrates that extinction is not unlearning. That is, the learned response may seem to disappear, but it is *not* eliminated or erased (Archbold & others, 2010; Rescorla, 2001).

extinction (in classical conditioning) The gradual weakening and apparent disappearance of conditioned behavior. In classical conditioning, extinction occurs when the conditioned stimulus is repeatedly presented without the unconditioned stimulus.

spontaneous recovery The reappearance of a previously extinguished conditioned response after a period of time without exposure to the conditioned stimulus.

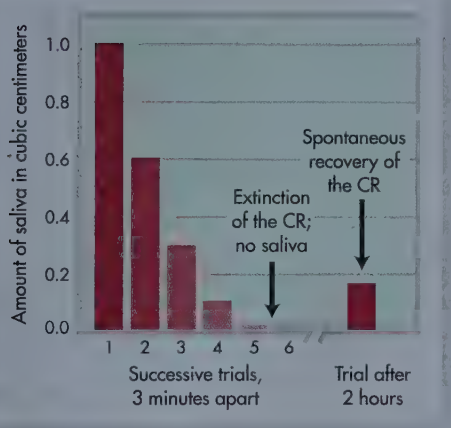


FIGURE 5.2 Extinction and Spontaneous Recovery in Pavlov's Laboratory
This demonstration involved a dog that had already been conditioned to salivate (the CR) to just the sight of the meat powder (the CS). During the extinction phase, the CS was repeatedly presented at three-minute intervals and held just out of the dog's reach. As you can see in the graph, over the course of six trials the amount of saliva secreted by the dog quickly decreased to zero. This indicates that *extinction* had occurred. After a two-hour rest period, the CS was presented again. At the sight of the meat powder, the dog secreted saliva once more, evidence for the *spontaneous recovery* of the conditioned response.

Source: Data adapted from Pavlov (1927).

CONCEPT REVIEW 5.1

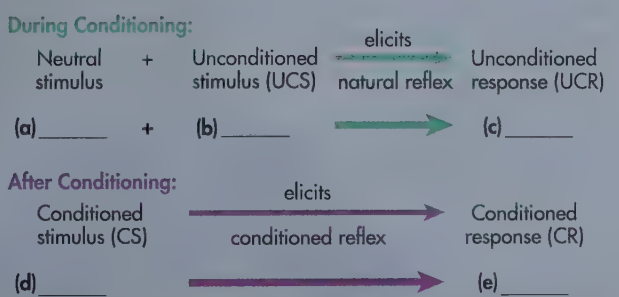
Elements of Classical Conditioning

For each of the following examples, use the diagram in the column on the right to help identify the neutral stimulus, UCS, UCR, CS, and CR.

1. When Cindy's four-month-old infant cried, she would begin breast-feeding him. One evening, Cindy went to a movie with her husband, leaving her baby at home with a sitter. When an infant in the theater began to cry, Cindy experienced the "let-down" reflex, and a few drops of milk stained her new silk blouse.

2. After swimming in the lake near his home one day, Frank emerged from the water covered with slimy, bloodsucking leeches all over his legs and back. He was revolted as he removed the leeches. Now, every time he passes the lake, Frank shudders in disgust.

3. Every time two-year-old Jodie heard the doorbell ring, she raced to open the front door. On Halloween night, Jodie answered the doorbell and encountered a scary monster with nine flashing eyes. Jodie screamed in fear and ran away. Now Jodie screams and hides whenever the doorbell rings.



From Pavlov to Watson

The Founding of Behaviorism

KEY THEME

› Behaviorism was founded by John Watson, who redefined psychology as the scientific study of behavior.

KEY QUESTIONS

› What were the fundamental assumptions of behaviorism?

› How did Watson use classical conditioning to explain and produce conditioned emotional responses?

› How did Watson apply classical conditioning techniques to advertising?

Over the course of three decades, Pavlov systematically investigated different aspects of classical conditioning. Throughout this process, he used dogs almost exclusively as his experimental subjects. Since Pavlov believed he had discovered the mechanism by which all learning occurs, it seems ironic that he had very little to say about applications of classical conditioning to human behavior. This irony is less puzzling when you understand that Pavlov wanted nothing to do with the newly established science of psychology. Why?

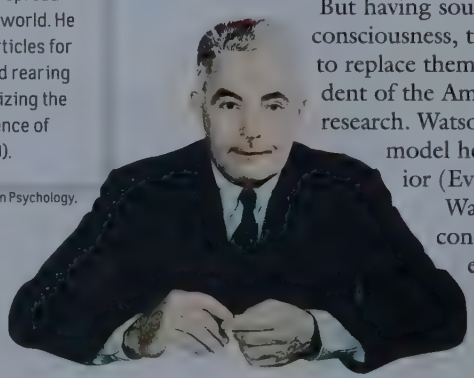
At the beginning of the twentieth century, psychology's early founders had defined the field as *the scientific study of the mind* (see Chapter 1). They advocated the use of introspective self-reports to achieve two fundamental goals: describing and explaining conscious thought and perceptions. Because the early psychologists wanted to study subjective states of consciousness, Pavlov did not see psychology as an exact or precise science, like physiology or chemistry. As Pavlov (1927) wrote, "It is still open to discussion whether psychology is a natural science, or whether it can be regarded as a science at all."

At about the same time Pavlov was conducting his systematic studies of classical conditioning in the early 1900s, a young psychologist named **John B. Watson** was attracting attention in the United States. Watson, like Pavlov, believed that psychology was following the wrong path by focusing on the study of subjective mental processes (Berman & Lyons, 2007). In 1913, Watson directly challenged the early founders of psychology in his landmark article titled "Psychology as the Behaviorist Views It." Watson's famous article opened with these sentences:

> Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness.

With the publication of this article, Watson founded a new school, or approach, in psychology, called **behaviorism.** Watson strongly advocated that psychology should be redefined as *the scientific study of behavior.* As he later (1924) wrote, "Let us limit ourselves to things that can be observed, and formulate laws concerning only those things. Now what can we observe? We can observe *behavior—what the organism does or says.*"

John Broadus Watson (1878–1958) Watson founded behaviorism in the early 1900s, emphasizing the scientific study of observable behaviors rather than the study of subjective mental processes (Hall, 2009). His influence spread far beyond the academic world. He wrote many books and articles for the general public on child rearing and other topics, popularizing the findings of the "new" science of psychology (Rilling, 2000).



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But having soundly rejected the methods of introspection and the study of consciousness, the young Watson was somewhat at a loss for a new method to replace them (Fancher, 1996). By 1915, when Watson was elected president of the American Psychological Association, he had learned of Pavlov's research. Watson (1916) embraced the idea of the conditioned reflex as the model he had been seeking to investigate and explain human behavior (Evans & Rilling, 2000).

Watson believed that virtually *all* human behavior is a result of conditioning and learning—that is, due to past experience and environmental influences. In championing behaviorism, Watson took these views to an extreme, claiming that neither talent, personality, nor intelligence was inherited. In a characteristically bold statement, Watson (1924) proclaimed:

> I should like to go one step further now and say, "Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors." I am going beyond my facts and I admit it, but so have the advocates of the contrary and they have been doing it for many thousands of years.

behaviorism School of psychology and theoretical viewpoint that emphasizes the scientific study of observable behaviors, especially as they pertain to the process of learning.

Needless to say, Watson never actually carried out such an experiment, and his boast clearly exaggerated the role of the environment to make his point. Nevertheless, Watson's influence on psychology cannot be overemphasized. Behaviorism was to dominate psychology in the United States for more than 50 years. And, as you'll see in the next section, Watson did carry out a famous and controversial experiment to demonstrate how human behavior could be classically conditioned.

Conditioned Emotional Reactions

Watson believed that, much as Pavlov's dogs reflexively salivated to food, human emotions could be thought of as reflexive responses involving the muscles and glands. In studies with infants, Watson (1919) identified three emotions that he believed represented inborn and natural unconditioned reflexes—fear, rage, and love. According to Watson, each of these innate emotions could be reflexively triggered by a small number of specific stimuli. For example, he found two stimuli that could trigger the reflexive fear response in infants: a sudden loud noise and a sudden dropping motion.

The Famous Case of Little Albert

Watson's interest in the role of classical conditioning in emotions set the stage for one of the most famous and controversial experiments in the history of psychology. In 1920, Watson and a graduate student named Rosalie Rayner set out to demonstrate that classical conditioning could be used to deliberately establish a conditioned emotional response in a human subject. Their subject was a baby, whom they called "Albert B.," but who is now more popularly known as "Little Albert." Little Albert lived with his mother in the Harriet Lane Hospital in Baltimore, where his mother was employed.

Watson and Rayner (1920) first assessed Little Albert when he was only nine months old. Little Albert was a healthy, unusually calm baby who showed no fear when presented with a tame white rat, a rabbit, a dog, and a monkey. He was also unafraid of cotton, masks, and even burning newspapers! But, as with other infants whom Watson had studied, fear could be triggered in Little Albert by a sudden loud sound—clanging a steel bar behind his head. In this case, the sudden clanging noise is the unconditioned stimulus, and the unconditioned response is fear.

Two months after their initial assessment, Watson and Rayner attempted to condition Little Albert to fear the tame white rat (the conditioned stimulus). Watson stood behind Little Albert. Whenever Little Albert reached toward the rat, Watson clanged the steel bar with a hammer. Just as before, of course, the unexpected loud CLANG! (the unconditioned stimulus) startled and scared the daylights out of Little Albert (the unconditioned response).

During the first conditioning session, Little Albert experienced two pairings of the white rat with the loud clanging sound. A week later, he experienced five more pairings of the two stimuli. After only these seven pairings of the loud noise and the white rat, the white rat alone triggered the conditioned response—extreme fear—in Little Albert (see Figure 5.3 on the next page). As Watson and Rayner (1920) described:

> The instant the rat was shown, the baby began to cry. Almost instantly he turned sharply to the left, fell over on [his] left side, raised himself on all fours and began to crawl away so rapidly that he was caught with difficulty before reaching the edge of the table.



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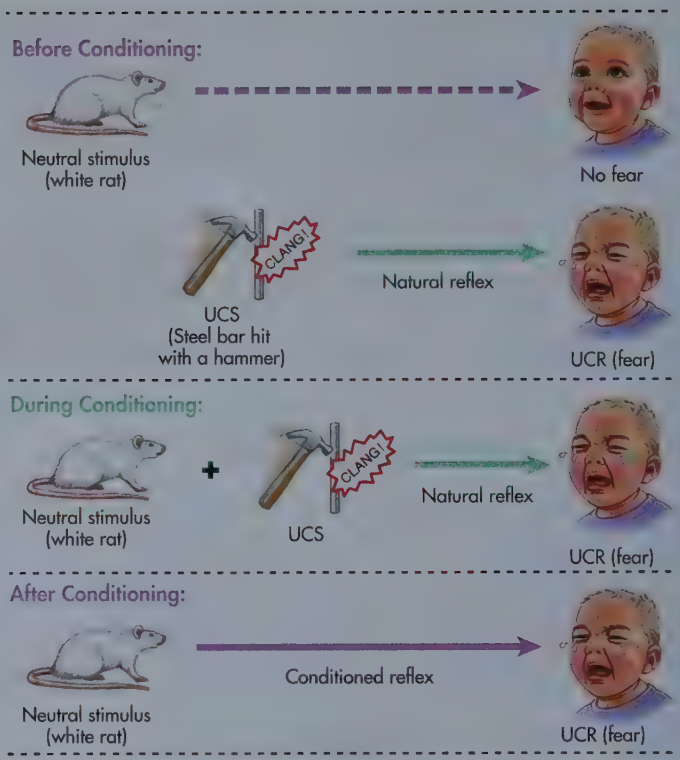


FIGURE 5.3 A Classically Conditioned Fear Response In the photograph below, Rosalie Rayner holds Little Albert as John Watson looks on. Little Albert is petting the tame white rat, clearly not afraid of it. But, after being repeatedly paired with the UCS (a sudden, loud noise), the white rat becomes a CS. After conditioning, Little Albert is terrified of the tame rat. His fear generalized to other furry objects, including rabbits, cotton, Rayner's fur coat, and Watson in a Santa Claus beard.

Watson and Rayner also found that stimulus generalization had taken place. Along with fearing the rat, Little Albert was now afraid of other furry animals, including a dog and a rabbit. He had even developed a classically conditioned fear response to a variety of fuzzy objects—a sealskin coat, cotton, Watson's hair, and a white-bearded Santa Claus mask!

Although the Little Albert study has attained legendary status in psychology, it had several problems (Harris, 1979, 2011; Paul & Blumenthal, 1989). One criticism is that the experiment was not carefully designed or conducted. For example, Albert's fear and distress were not objectively measured but were subjectively evaluated by Watson and Rayner.

The experiment is also open to criticism on ethical grounds. Watson and Rayner (1920) did not extinguish Little Albert's fear of furry animals and objects, even though they believed that such conditioned emotional responses would "persist and modify personality throughout life." Today, conducting such an experiment would be considered unethical.

Whether Watson and Rayner had originally intended to extinguish the fear is not completely clear (see Paul & Blumenthal, 1989). Watson (1930) later wrote that he and Rayner could not try to eliminate Albert's fear response because the infant had been adopted by a family in another city shortly after the experiment had concluded.

Generations of psychologists have wondered what happened to Little Albert. After several years of detective work, psychologist Hall P. Beck and his colleagues (2009, 2010) identified Albert as Douglas Merritt, the son of a woman working at the hospital where the experiment was conducted. Douglas died at the age of 6, most likely from complications of meningitis. The evidence is circumstantial, however, and some psychologists think that Little Albert's identity and fate remain unknown (Powell, 2010a, b, 2011; Reese, 2010).

You can probably think of situations, objects, or people that evoke a strong classically conditioned emotional reaction in you, such as fear or anger. One example that many of our students can relate to is that of becoming classically

IN FOCUS

Watson, Classical Conditioning, and Advertising

From shampoos to soft drinks, advertising campaigns often use sexy models to promote their products. Today, we take this advertising tactic for granted. But it's actually yet another example of Watson's influence.

Shortly after the Little Albert experiment, Watson's wife discovered that he was having an affair with his graduate student Rosalie Rayner. Following a scandalous and highly publicized divorce, Watson was fired from his academic position. Despite his international fame as a scientist, no other university would hire him (Benjamin & others, 2007). Banned from academia, Watson married Rayner and joined the J. Walter Thompson advertising agency (Buckley, 1989; Carpintero, 2004).

Watson was a pioneer in the application of classical conditioning principles to advertising. "To make your consumer react," Watson told his colleagues at the ad agency, "tell him something that will tie him up with fear, something that will stir up a mild rage, that will call out an affectionate or love response, or strike at a deep psychological or habit need" (quoted in Buckley, 1982).



Duke University Special Collections Library

Watson applied this technique to ad campaigns for Johnson & Johnson Baby Powder and Pebeco toothpaste in the 1920s. For the baby powder ad, Watson intentionally tried to stimulate an anxiety response in young mothers by creating doubts about their ability to care for their infants.

The Pebeco toothpaste campaign targeted the newly independent young woman who smoked. The ad raised the fear that attractiveness might be diminished by the effects of smoking—and Pebeco toothpaste was promoted as a way of increasing sexual attractiveness. One ad read, "Girls! Don't worry any more about smoke-stained teeth or tobacco-tainted breath. You can smoke and still be lovely if you'll just use Pebeco twice a day." Watson also developed ad campaigns for Pond's cold cream, Maxwell House coffee, and Camel cigarettes.

While Watson may have pioneered the strategy of associating products with "sex appeal," modern advertising has taken this technique to an extreme. Similarly, some ad campaigns pair products with images of adorable babies, cuddly kittens, happy families, or other "natural" stimuli that elicit warm, emotional responses. If classical conditioning occurs, the product by itself will also elicit a warm, emotional response.

Are such procedures effective? In a word, yes. Attitudes toward a product or a particular brand can be influenced by advertising and marketing campaigns that use classical conditioning methods (Hofmann & others, 2010).

conditioned to cues associated with a person whom you strongly dislike, such as a demeaning boss or a hateful ex-lover. After repeated negative experiences (the UCS) with the person eliciting anger or fear (the UCR), a wide range of cues can become conditioned stimuli (CSs)—the person's name, the sight of the person, locations associated with the person, and so forth—and elicit a strong negative emotional reaction (the CR) in you. Just mentioning the person's name can make your heart pound and send your blood pressure soaring. Other emotional responses, such as feelings of happiness or sadness, can also be classically conditioned.

In this chapter's Prologue, we saw that Erv became classically conditioned to feel anxious whenever he entered the attic. The attic (the original neutral stimulus) was coupled with being trapped in extreme heat (the UCS), which produced fear (the UCR). Following the episode, Erv found that going into the attic (now a CS) triggered mild fear and anxiety (the CR). Like Erv, many people experience a conditioned fear response to objects, situations, or locations that are associated with some kind of traumatic experience or event. In fact, despite their knowledge of classical conditioning, your authors are not immune to this effect (see photo).



Courtesy of the authors

Classically Conditioned Emotional Reactions After being involved in a serious auto accident, many people develop a conditioned emotional response to the scene of the accident. Your author Don is no exception. He still shudders when he drives through the intersection of 10th and Cincinnati streets near the downtown campus of Tulsa Community College. His car (shown here) was crumpled by an SUV that sped up through a red light and smashed into the driver's side, spinning the car almost 180 degrees. (Fortunately, the entire sequence of events was witnessed by the Tulsa police officer in the car directly behind Don.) Although Don wasn't seriously hurt, just looking at the photo of the intersection (and his totaled car) makes his neck tighten up and his heart race. In this example, can you identify the UCS, UCR, CS, and CR?



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"Your magazine smells fabulous. May I kiss you?"

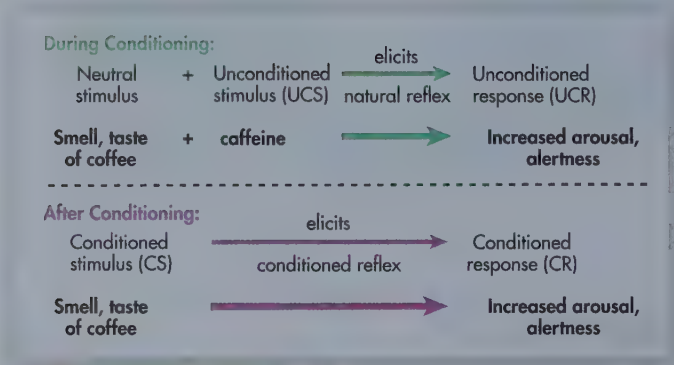
Other Classically Conditioned Responses

Under the right conditions, virtually any automatic response can become classically conditioned. For example, some aspects of sexual responses can become classically conditioned, sometimes inadvertently. To illustrate, suppose that a neutral stimulus, such as the scent of a particular cologne, is regularly paired with the person with whom you are romantically involved. In other words, your romantic partner almost always wears his or her "signature" cologne. You, of course, are most aware of the scent when you are physically close to your partner in sexually arousing situations. After repeated pairings, the initially neutral stimulus—the particular cologne scent—can become a conditioned stimulus. Now, the scent of the cologne evokes feelings of romantic excitement or mild sexual arousal even in the absence of your lover or, in some cases, long after the relationship has ended. And, in fact, a wide variety of stimuli can become "sexual turn-ons" through classical conditioning.

Classical conditioning can also influence drug responses. For example, if you are a regular coffee drinker like both of your authors, you may have noticed that you begin to feel more awake and alert after just a few groggy sips of your first cup of coffee in the morning. However, it takes at least 20 minutes for the caffeine from the coffee to reach significant levels in your bloodstream. If you're feeling more awake *before* blood levels of caffeine rise, it's probably because you've developed a classically conditioned response to the sight, smell, and taste of coffee (see Figure 5.4). Confirming that everyday experience, such conditioned responses to caffeine-associated stimuli have also been demonstrated experimentally (e.g., Flaten & Blumenthal, 1999; Mikalsen & others, 2001).

Once this classically conditioned drug effect becomes well established, the smell or taste of coffee—even decaffeinated coffee—can trigger the conditioned response of increased arousal and alertness (Attwood & others, 2010).

Conditioned drug effects seem to be involved in at least some instances of placebo response (Stewart-Williams & Podd, 2004; Benedetti & others, 2010). Also called *placebo effect*, a **placebo response** occurs when an individual has a psychological and physiological reaction to what is actually a fake treatment or drug. We'll discuss this phenomenon in more detail in Chapter 13.





Uyen Le/iStockphoto

FIGURE 5.4 Classically Conditioned Drug Effects: Does Just the Smell of a Starbucks Espresso Perk You Up? If it does, classical conditioning is at work! Pavlov (1927) suggested that administering a drug could be viewed as a conditioning trial. Just like pairing the sound of a bell with the presentation of food, if specific environmental cues are repeatedly paired with a drug's administration, they can become conditioned stimuli that eventually elicit the drug's effect. For a regular coffee drinker, the sight, smell, and taste of freshly brewed coffee are the original neutral stimuli that, after being repeatedly paired with caffeine (the UCS), eventually become conditioned stimuli, producing the CR: increased arousal and alertness.

Contemporary Views of Classical Conditioning

KEY THEME

› Contemporary learning researchers acknowledge the importance of both cognitive factors and evolutionary influences in classical conditioning.

KEY QUESTIONS

› How has the involvement of cognitive processes in classical conditioning been demonstrated experimentally?

› What is meant by the phrase "the animal behaves like a scientist" in classical conditioning?

› How do taste aversions challenge the basic conditioning principles, and what is biological preparedness?

The traditional behavioral perspective holds that classical conditioning results from a simple association of the conditioned stimulus and the unconditioned stimulus. According to the behaviorists, mental or cognitive processes such as thinking, anticipating, or deciding were not needed to explain the conditioning process.

However, not all psychologists were convinced that mental processes were so uninvolved in learning. Some wondered whether conditioning procedures did more

than simply change how an organism responded. Could conditioning procedures change what the organism *knows* as well as what it *does*? According to the *cognitive perspective* (see Chapter 1), mental processes as well as external events are important components in the learning of new behaviors. In the next section, we'll look at the role cognitive processes seem to play in classical conditioning. As you'll see, today's psychologists view the classical conditioning process very differently from the way Pavlov or Watson did (see Bouton, 2007).

placebo response An individual's psychological and physiological response to what is actually a fake treatment or drug; also called *placebo effect*.

Cognitive Aspects of Classical Conditioning

Reliable Signals

According to Pavlov, classical conditioning occurs simply because two stimuli are associated closely in time. The conditioned stimulus (the bell) precedes the unconditioned stimulus (the food) usually by no more than a few seconds. But is it possible that Pavlov's dogs were learning more than the mere association of two stimuli that occurred very close together in time?

To answer that question, let's begin with an analogy. Suppose that on your way to class you have to go through a railroad crossing. Every time a train approaches the crossing, warning lights flash. Being rather intelligent for your species, after a few weeks you conclude that the flashing lights will be quickly followed by a freight train barreling down the railroad tracks. You've learned an association between the flashing lights and an oncoming train because the lights are a *reliable signal* that predict the presence of the train.

Now imagine that a friend of yours also has to cross train tracks but at a different location. The railroad has had nothing but problems with the warning lights at that crossing. Sometimes the warning lights flash before a train roars through, but sometimes they don't. And sometimes they flash when no train is coming. Does your friend learn an association between the flashing lights and oncoming trains? No, because here the flashing lights are an *unreliable signal*—they seem to have no relationship to a train's arrival.

Psychologist **Robert A. Rescorla** demonstrated that classically conditioned rats also assess the reliability of signals, much like you and your friend did at the different railroad crossings. In Rescorla's 1968 experiment, one group of rats heard a tone (the conditioned stimulus) that was paired 20 times with a brief electric shock (the unconditioned stimulus). A second group of rats experienced the *same* number of tone–shock pairings, but this group also experienced an *additional* 20 shocks with *no* tone (see Figure 5.5).

Then Rescorla tested for the conditioned fear response by presenting the tone alone to each group of rats. According to the traditional classical conditioning model,

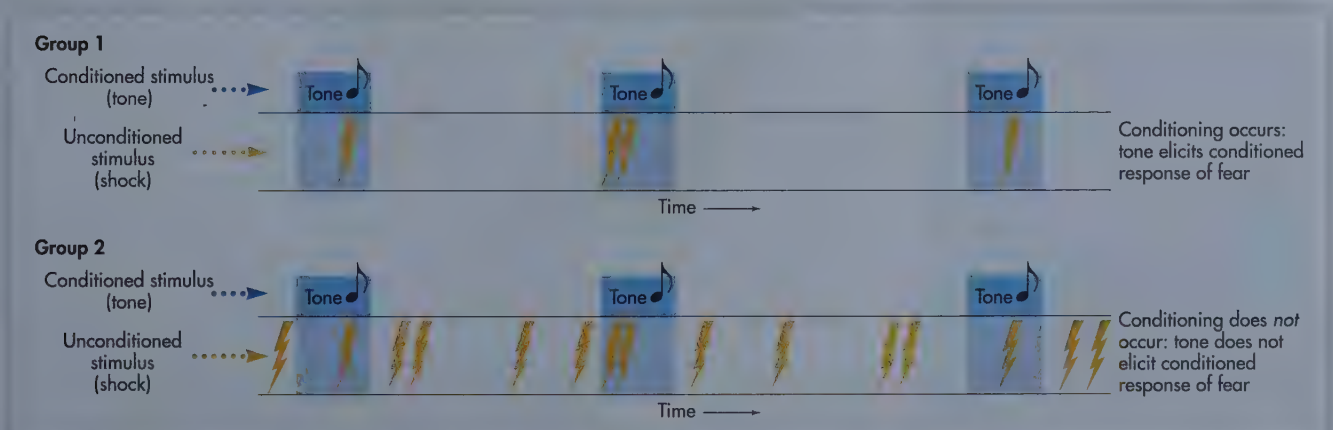
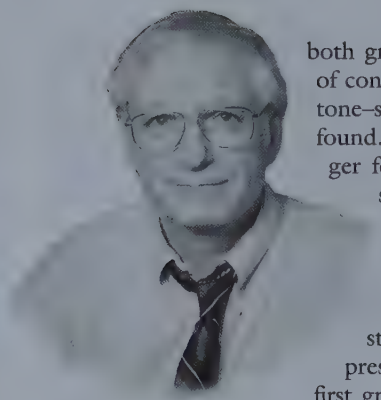


FIGURE 5.5 Reliable and Unreliable Signals In Rescorla's experiment, both groups of rats experienced the same number of tone–shock pairings. However, the rats in group 1 received a shock only when the tone was sounded, while the rats in group 2 experienced additional shocks that were not paired with the tone. Subsequently, the rats in group 1 displayed a conditioned fear response to the tone and the rats in group 2 did not. Why did only the rats in group 1 become conditioned to display fear when they heard the tone?

Pavlovian conditioning is a sophisticated and sensible mechanism by which organisms represent the world. Our current understanding of Pavlovian conditioning leads to its characterization as a mechanism by which the organism encodes relationships between events in the world. The conditioned stimulus and the unconditioned stimulus are simply two events, and the organism can be seen as trying to determine the relationship between them.

–Robert A. Rescorla (1997)



Courtesy of Dr. Robert Rescorla

both groups of rats should have displayed the same levels of conditioned fear. After all, each group had received 20 tone–shock pairings. However, this is not what Rescorla found. The rats in the first group displayed a much stronger fear response to the tone than did the rats in the second group. Why?

According to Rescorla (1988), classical conditioning depends on the *information* the conditioned stimulus provides about the unconditioned stimulus. For learning to occur, the conditioned stimulus must be a *reliable signal* that predicts the presentations of the unconditioned stimulus. For the first group of rats, that was certainly the situation. Every time the tone sounded, a shock followed. But for the second group, the tone was an unreliable signal. Sometimes the tone preceded the shock, and sometimes the shock occurred without warning.

Rescorla concluded that the rats in both groups were *actively processing information* about the reliability of the signals they encountered. Rather than merely associating two closely paired stimuli, as Pavlov suggested, the animals assess the *predictive value* of stimuli. Applying this interpretation to classical conditioning, we can conclude that Pavlov's dogs learned that the bell was a signal that *reliably predicted* that food would follow.

According to this view, animals use cognitive processes to draw inferences about the signals they encounter in their environments. To Rescorla (1988), classical conditioning "is not a stupid process by which the organism willy-nilly forms associations between any two stimuli that happen to co-occur." Rather, his research suggests that "the animal behaves like a scientist, detecting causal relations among events and using a range of information about those events to make the relevant inferences" (Rescorla, 1980).

Because of studies by Rescorla and other researchers, today's understanding of how learning occurs in classical conditioning is very different from the explanations offered by Pavlov and Watson (Kirsch & others, 2004). Simply pairing events in time may not be enough for classical conditioning to occur. Instead, a conditioned stimulus must *reliably signal* that the unconditioned stimulus will follow. Put simply, classical conditioning seems to involve *learning the relationships between events* (Rescorla, 1988).

Classical Conditioning and Survival Animals quickly learn the signals that predict the approach of a predator. In classical conditioning terms, they learn to associate the approach of a predator (the unconditioned stimuli) with particular sounds, smells, or sights (the originally neutral stimuli that become conditioned stimuli). To survive, animals that are vulnerable to predators, such as this frightened deer, must be able to use environmental signals to predict events in their environment. A rustle in the underbrush, the faint whiff of a mountain lion, or a glimpse of a human tells the animal that it's time to flee.



Manfred Danegger/Photolibrary

Evolutionary Aspects of Classical Conditioning

Biological Predispositions to Learn

According to Darwin's *theory of evolution by natural selection,* both the physical characteristics and the natural behavior patterns of any species have been shaped by evolution to maximize adaptation to the environment. Thus, just as physical characteristics vary from one species to another, so do natural behavior patterns. Some psychologists wondered whether an animal's natural behavior patterns, as shaped by evolution, would also affect how it learned new behaviors, especially behaviors important to its survival.

According to traditional behaviorists, the general principles of learning applied to virtually all animal species and all learning situations. Thus, they argued that the general learning principles of classical conditioning would be the same regardless of the species or the response being conditioned. However, in the 1960s, some researchers began to report "exceptions" to the well-established principles of classical conditioning (Lockard, 1971; Seligman, 1970). As you'll see in this section, one important exception involved a phenomenon known as a *taste aversion.* The study of taste aversions contributed to a new awareness of the importance of the organism's natural behavior patterns in classical conditioning.

Taste Aversions and Classical Conditioning: Spaghetti? No, Thank You!

taste aversion A classically conditioned dislike for and avoidance of a particular food that develops when an organism becomes ill after eating the food.

A few years ago, Sandy made a pot of super spaghetti, with lots of mushrooms, herbs, spices, and some extra-spicy sausage. Being very fond of Sandy's spaghetti, Don ate two platefuls. Several hours later, in the middle of the night, Don came down with a nasty stomach virus. Predictably, Sandy's super spaghetti came back up—a colorful spectacle, to say the least. As a result, Don developed a **taste aversion**—he avoided eating spaghetti and felt queasy whenever he smelled spaghetti sauce. Don's taste aversion to spaghetti persisted for more than a year.

Such learned taste aversions are relatively common. Our students have told us about episodes of motion sickness, morning sickness, or illness that resulted in taste aversions to foods as varied as cotton candy, strawberries, and chicken soup. In some cases, a taste aversion can persist for years.

At first glance, it seems as if taste aversions can be explained by classical conditioning. In Don's case, a neutral stimulus (spaghetti) was paired with an unconditioned stimulus (a stomach virus), which produced an unconditioned response (nausea). Now a conditioned stimulus, the spaghetti sauce by itself, elicited the conditioned response of nausea.

But notice that this explanation seems to violate two basic principles of classical conditioning. First, the conditioning did not require repeated pairings. Conditioning occurred in a *single pairing* of the conditioned stimulus and the unconditioned stimulus. Second, the time span between these two stimuli was *several hours*, not a matter of seconds. Is this possible? The anecdotal reports of people who develop specific taste aversions seem to suggest it is. But such reports lack the objectivity and systematic control that a scientific explanation of behavior requires.

Enter psychologist **John Garcia,** who demonstrated that taste aversions could be produced in laboratory rats under controlled conditions (Garcia & others, 1966). Garcia's procedure was straightforward. Rats first drank saccharin-flavored water (the neutral stimulus). Hours later, the rats were injected with a drug (the unconditioned stimulus) that produced gastrointestinal distress (the unconditioned response). After the rats recovered from their illness, they refused to drink the flavored water again. The rats had developed a taste aversion to the saccharin-flavored water, which had become a conditioned stimulus.

At first, many psychologists were skeptical of Garcia's findings because they seemed to violate the basic principles of classical conditioning (Davis & Riley, 2010). Several leading psychological journals refused to publish Garcia's research, saying the results were unconvincing or downright impossible (Garcia, 1981, 2003). But Garcia's results have been replicated many times. In fact, later research showed that taste aversions could develop even when a full 24 hours separated the presentation of the flavored water and the drug that produced illness (Davis & Riley, 2010).

Conditioned taste aversions also challenged the notion that virtually any stimulus can become a conditioned stimulus. As Pavlov (1928) wrote, "Any natural phenomenon chosen at will may be converted into a conditioned stimulus . . . any visual stimulus, any desired sound, any odor, and the stimulation of any part of the skin." After all, Pavlov had demonstrated that dogs could be classically conditioned to salivate to a ringing bell, a ticking metronome, and even the sight of geometric figures.

But if this were the case, then why didn't Don develop an aversion to other stimuli he encountered between the time he ate the spaghetti and when he got sick? Why was it that only the spaghetti sauce became a conditioned stimulus that triggered nausea, not the dinner table, the silverware—or even Sandy, for that matter?

Contrary to what Pavlov suggested, Garcia and his colleagues demonstrated that the particular conditioned stimulus that is used *does* make a difference in classical conditioning (Garcia & Koelling, 1966). In another series of experiments, Garcia found that rats did *not* learn to associate a taste with a painful event, such as a shock. Nor did they learn to associate a flashing light and noise with illness. Instead, rats were much more likely to associate a *painful stimulus,* such as a shock, with *external stimuli,* such as flashing lights and noise. And rats were much more likely to associate a *taste stimulus* with *internal stimuli*—the physical discomfort of illness. Garcia and Koelling (1966) humorously suggested that a sick rat, like a sick person, speculates, "It must have been something I ate."



John Garcia (b. 1917) John Garcia grew up working on farms in northern California. In his late 20s, Garcia enrolled at a community college. At the age of 48, Garcia earned his Ph.D. in psychology from the University of California, Berkeley (Garcia, 1997). Garcia was one of the first researchers to experimentally demonstrate the existence of taste aversions and other "exceptions" to the general laws of classical conditioning. His research emphasized the importance of the evolutionary forces that shape the learning process.

Courtesy John Garcia

biological preparedness In learning theory, the idea that an organism is innately predisposed to form associations between certain stimuli and responses.

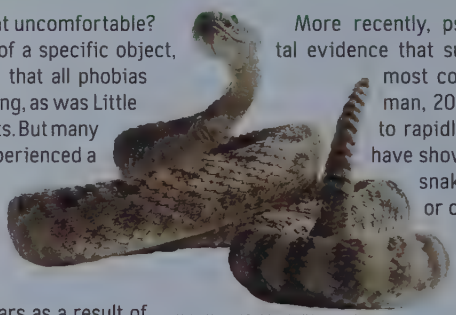
Why is it that certain stimuli are more easy to associate than others? One factor that helps explain Garcia's results is **biological preparedness**—the idea that an organism is innately predisposed to form associations between certain stimuli and responses (Freeman & Riley, 2009). If the particular stimulus and response combination is *not* one that an animal is biologically prepared to associate, then the association may not occur or may occur only with great difficulty (see the In Focus box, "Evolution, Biological Preparedness, and Conditioned Fears: What Gives You the Creeps?").

When this concept is applied to taste aversions, rats (and people) seem to be biologically prepared to associate an illness with a taste rather than with a location, a person, or an object. Hence, Don developed an aversion to the spaghetti sauce and not to the fork he had used to eat it. Apparently, both humans and rats are biologically prepared to learn taste aversions relatively easily. Thus, taste aversions can be

IN FOCUS

Evolution, Biological Preparedness, and Conditioned Fears: What Gives You the Creeps?

Do these photographs make you somewhat uncomfortable?



Mike Kemp/ Rubberball Images/ Jupiterimages

A *phobia* is an extreme, irrational fear of a specific object, animal, or situation. It was once believed that all phobias were acquired through classical conditioning, as was Little Albert's fear of the rat and other furry objects. But many people develop phobias without having experienced a traumatic event in association with the object of their fear. Obviously, other forms of learning, such as observational learning, are involved in the development of some fears (Bruchey & others, 2010).

When people do develop conditioned fears as a result of traumatic events, they are more likely to associate fear with certain stimuli rather than others. Erv, not surprisingly, has acquired a conditioned fear response to the "killer attic." But why doesn't Erv shudder every time he hears a lawn mower or sees a ladder, the clothes he was wearing when he got trapped, or his can of oil?

Psychologist **Martin Seligman** (1971) noticed that phobias seem to be quite selective. Extreme, irrational fears of snakes, spiders, heights, and small enclosed places (like Erv and Fern's attic) are relatively common. But very few people have phobias of stairs, ladders, electrical outlets or appliances, or sharp objects, even though these things are far more likely to be associated with accidents or traumatic experiences.

Seligman proposed that humans are biologically prepared to develop fears of objects or situations—such as snakes, spiders, and heights—that may once have posed a threat to humans' evolutionary ancestors. As Seligman (1971) put it, "The great majority of phobias are about objects of natural importance to the survival of the species." According to this view, people don't commonly develop phobias of knives, stoves, or cars because they're not biologically prepared to do so.

Support for this view is provided by early studies that tried to replicate Watson's Little Albert research. Elsie Bregman (1934) was unable to produce a conditioned fear response to wooden blocks and curtains, although she followed Watson's procedure carefully. And Horace English (1929) was unable to produce a conditioned fear of a wooden duck. Perhaps we're more biologically prepared to learn a fear of furry animals than of wooden ducks, blocks, or curtains!

More recently, psychologists have accumulated experimental evidence that supports an evolutionary explanation for the most common phobias (Coelho & Purkis, 2009; Öhman, 2009). People seem to be biologically prepared to rapidly detect snakes and spiders. Several studies have shown that people are faster at detecting a single snake or spider image among photos of flowers or other non-threatening objects than they are at detecting a single flower image among pictures of snakes or spiders (see LoBue, 2010; LoBue & others, 2010). One study showed that monkeys also more quickly detect images of a snake than of a flower (Shibasaki & Kawai, 2009).

And, both humans and monkeys learn to fear snakes and spiders more rapidly than they learn to fear neutral stimuli, like flowers or mushrooms. They more rapidly acquire conditioned fear responses to pictures of snakes that have been paired with electric shock than to pictures of mushrooms and flowers that have been paired with electric shock (Ohman & Mineka, 2003, 2001).

Are such findings the result of frightening experiences with snakes or spiders? Or perhaps learned responses to the knowledge that snakes and spiders are dangerous? Research has shown that preschoolers and even infants are faster at spotting images of snakes and spiders among photos of flowers, frogs, or caterpillars (LoBue & DeLoache, 2008; LoBue, 2010; LoBue & DeLoache, 2010). They are also more likely to associate snakes and spiders with fearful stimuli, like angry faces or voices (DeLoache & LoBue, 2009; Rakison, 2009).

Öhman and Mineka (2003) suggest that because poisonous snakes, reptiles, and insects have been associated with danger throughout the evolution of mammals, there is an evolved "fear module" in the brain that is highly sensitized to such evolutionarily relevant stimuli. According to this explanation, individuals who more rapidly detected such dangerous animals would have been more likely to learn to avoid them and survive to reproduce and pass on their genes to future generations (Öhman & others, 2007; Coelho & Purkis, 2009). For more on how evolved brain mechanisms might be involved in fearful responses, see Chapter 8.



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classically conditioned more readily than can more arbitrary associations, such as that between a ringing bell and a plate of food.

Associations that are easily learned may reflect the evolutionary history and survival mechanisms of the particular animal species (Freeman & Riley, 2009). For example, rats in the wild eat a wide variety of foods. If a rat eats a new food and gets sick several hours later, it's likely to survive longer if it learns from this experience to avoid that food in the future (Kalat, 1985; Seligman, 1970).

That different species form some associations more easily than others also probably reflects the unique sensory capabilities and feeding habits that have evolved as a matter of environmental adaptation. Bobwhite quail, for instance, rely primarily on vision for identifying potential meals. In contrast, rats have relatively poor eyesight and rely primarily on taste and odor cues to identify food. Given these species differences, it shouldn't surprise you that quail, but not rats, can easily be conditioned to develop an aversion to blue-colored water—a *visual* stimulus. On the other hand, rats learn more readily than quail to associate illness with sour water—a *taste* stimulus (Wilcoxon & others, 1971). In effect, quail are biologically prepared to associate visual cues with illness, while rats are biologically prepared to associate taste cues with illness.

Taste aversion research emphasizes that the study of learning must consider the unique behavior patterns and capabilities of different species. As the result of evolution, animals have developed unique forms of behavior to adapt to their natural environments (Bolles, 1985). These natural behavior patterns and unique characteristics ultimately influence what an animal is capable of learning—and how easily it can be conditioned to learn a new behavior.



(both) Stuart Ellins, California State University

Conditioning Taste Aversions in Coyotes The fact that coyotes readily form taste aversions has been used to prevent them from preying on livestock (Bower, 1997; Garcia & Gustavson, 1997). To stop coyotes from killing lambs on sheep ranches, sheep carcasses are injected with lithium chloride, a drug that produces extreme nausea. In the top photo, the coyote has discovered the carcass and is eating it. In the bottom photo, the nauseous coyote is writhing on the ground. In one study, captive coyotes were fed lithium-tainted rabbit and sheep carcasses. When later placed in a pen with live rabbits and sheep, the coyotes avoided them rather than attack them. In fact, some of the coyotes threw up at the sight of a live rabbit (Gustavson & others, 1976).

Operant Conditioning

Associating Behaviors and Consequences

KEY THEME

› Operant conditioning deals with the learning of active, voluntary behaviors that are shaped and maintained by their consequences.

KEY QUESTIONS

› How did Edward Thorndike study the acquisition of new behaviors, and what conclusions did he reach?

› What were B. F. Skinner's key assumptions?

› How are positive reinforcement and negative reinforcement similar, and how are they different?

Classical conditioning can help explain the acquisition of many learned behaviors, including emotional and physiological responses. However, recall that classical conditioning involves reflexive behaviors that are automatically elicited by a specific stimulus. Most everyday behaviors don't fall into this category. Instead, they involve nonreflexive, or *voluntary,* actions that can't be explained with classical conditioning.

The investigation of how voluntary behaviors are acquired began with a young American psychology student named Edward L. Thorndike. A few years before Pavlov began his extensive studies of classical conditioning, Thorndike was using cats, chicks, and dogs to investigate how voluntary behaviors are acquired. Thorndike's pioneering studies helped set the stage for the later work of another American psychologist named B. F. Skinner. It was Skinner who developed *operant conditioning,* another form of conditioning that explains how we acquire and maintain voluntary behaviors.



Edward Lee Thorndike (1874–1949) As a graduate student, Thorndike became fascinated by psychology after taking a class taught by William James at Harvard University. Interested in the study of animal behavior, Thorndike conducted his first experiments with baby chicks. When his landlady protested about the chickens in his room, Thorndike moved his experiments, chicks and all, to the cellar of William James's home—much to the delight of the James children. Following these initial experiments, Thorndike constructed his famous "puzzle boxes" to study learning in cats. Later in life, Thorndike focused his attention on improving educational materials. Among his contributions was the Thorndike Barnhart Student Dictionary for children, which is still published today (R. L. Thorndike, 1991).

Humanities and Social Science Library/New York Public Library/Photo Researchers

Thorndike and the Law of Effect

Edward L. Thorndike was the first psychologist to systematically investigate animal learning and how voluntary behaviors are influenced by their consequences. At the time, Thorndike was only in his early 20s and a psychology graduate student. He conducted his pioneering studies to complete his dissertation and earn his doctorate in psychology. Published in 1898, Thorndike's dissertation, titled *Animal Intelligence: An Experimental Study of the Associative Processes in Animals,* is the most famous dissertation ever published in psychology (Chance, 1999). When Pavlov later learned of Thorndike's studies, he expressed admiration and credited Thorndike with having started objective animal research well before his own studies of classical conditioning (Hearst, 1999).

Thorndike's dissertation focused on the issue of whether animals, like humans, use reasoning to solve problems (Dewsbury, 1998). In an important series of experiments, Thorndike (1898) put hungry cats in specially constructed cages that he called "puzzle boxes." A cat could escape the cage by a simple act, such as pulling a loop or pressing a lever that would unlatch the cage door. A plate of food was placed just outside the cage, where the hungry cat could see and smell it.

Thorndike found that when the cat was first put into the puzzle box, it would engage in many different, seemingly random behaviors to escape. For example, the cat would scratch at the cage door, claw at the ceiling, and try to squeeze through the wooden slats (not to mention complain at the top of its lungs). Eventually, however, the cat would accidentally pull on the loop or step on the lever, opening the door latch and escaping the box. After several trials in the same puzzle box, a cat could get the cage door open very quickly.

Thorndike (1898) concluded that the cats did *not* display any humanlike insight or reasoning in unlatching the puzzle box door. Instead, he explained the cats' learning as a process of *trial and error* (Chance, 1999). The cats gradually learned to associate certain responses with successfully escaping the box and gaining the food reward. According to Thorndike, these successful behaviors became "stamped in," so that a cat was more likely to repeat these behaviors when placed in the puzzle box again. Unsuccessful behaviors were gradually eliminated.

Thorndike's observations led him to formulate the **law of effect**: Responses followed by a "satisfying state of affairs" are "strengthened" and more likely to occur again in the same situation. Conversely, responses followed by an unpleasant or "annoying state of affairs" are "weakened" and less likely to occur again.

Thorndike's description of the law of effect was an important first step in understanding how active, voluntary behaviors can be modified by their consequences. Thorndike, however, never developed his ideas on learning into a formal model or system (Hearst, 1999). Instead, he applied his findings to education, publishing many books on educational psychology (Mayer & others, 2003). Some 30 years after Thorndike's famous puzzle-box studies, the task of further investigating how voluntary behaviors are acquired and maintained would be taken up by another American psychologist, B. F. Skinner.



Thorndike's Puzzle Box Shown here is one of Thorndike's puzzle boxes, which were made mostly out of wood slats and wire mesh. Thorndike constructed a total of 15 different puzzle boxes, which varied in how difficult they were for a cat to escape from. In a simple box like this one, a cat merely had to pull on a loop of string at the back of the cage to escape. More complex boxes required the cat to perform a chain of three responses—step on a treadle, pull on a string, and push a bar up or down (Chance, 1999).

Yale University Library

B. F. Skinner and the Search for "Order in Behavior"

From the time he was a graduate student in psychology until his death, the famous American psychologist **B. F. Skinner** searched for the "lawful processes" that would explain "order in behavior" (Skinner, 1956, 1967). Skinner was a staunch behaviorist. Like John Watson, Skinner strongly believed that psychology should restrict itself to studying only phenomena that could be objectively measured and verified—outwardly observable behavior and environmental events.

Skinner (1974) acknowledged the existence of what he called "internal factors," such as thoughts, expectations, and perceptions (Moore, 2005a). However, he believed that internal thoughts, beliefs, emotions, or motives could *not* be used to explain behavior. These fell into the category of "private events" that defy direct scientific observation and should not be included in an objective, scientific explanation of behavior (Baum & Heath, 1992; Foxwall, 2007).

Along with being influenced by Watson's writings, Skinner greatly admired Ivan Pavlov's work. Prominently displayed in Skinner's university office was one of his most prized possessions—an autographed photo of Pavlov (Catania & Laties, 1999). Skinner acknowledged that Pavlov's classical conditioning could explain the learned association of stimuli in certain reflexive responses (Iversen, 1992). But classical conditioning was limited to existing behaviors that were reflexively elicited. Skinner (1979) was convinced that he had "found a process of conditioning that was different from Pavlov's and much more like most learning in daily life." To Skinner, the most important form of learning was demonstrated by *new* behaviors that were *actively emitted* by the organism, such as the active behaviors produced by Thorndike's cats in trying to escape the puzzle boxes.

Skinner (1953) coined the term **operant** to describe any "active behavior that operates upon the environment to generate consequences." In everyday language, Skinner's principles of operant conditioning explain how we acquire the wide range of *voluntary* behaviors that we perform in daily life. But as a behaviorist who rejected mentalistic explanations, Skinner avoided the term *voluntary* because it would imply that behavior was due to a conscious choice or intention.

Skinner defined operant conditioning concepts in very objective terms and he avoided explanations based on subjective mental states (Moore, 2005b). We'll closely follow Skinner's original terminology and definitions.



Bettmann/ Corbis

Burrhus Frederick Skinner (1904–1990) As a young adult, Skinner had hoped to become a writer. When he graduated from college, he set up a study in the attic of his parents' home and waited for inspiration to strike. After a year of "frittering" away his time, he decided that there were better ways to learn about human nature (Moore, 2005a). As Skinner (1967) later wrote, "A writer might portray human behavior accurately, but he did not understand it. I was to remain interested in human behavior, but the literary method had failed me; I would turn to the scientific.... The relevant science appeared to be psychology, though I had only the vaguest idea of what that meant."

Reinforcement

Increasing Future Behavior

In a nutshell, Skinner's **operant conditioning** explains learning as a process in which behavior is shaped and maintained by its consequences. One possible consequence of a behavior is reinforcement. **Reinforcement** is said to occur when a stimulus or an event follows an operant and increases the likelihood of the operant being repeated. Notice that reinforcement is defined by the effect it produces—increasing or strengthening the occurrence of a behavior in the future.

Let's look at reinforcement in action. Suppose you put your money into a soft-drink vending machine and push the button. Nothing happens. You push the button again. Nothing. You try the coin-return lever. Still nothing. Frustrated, you slam the machine with your hand. Yes! Your can of soda rolls down the chute. In the future, if another vending machine swallows your money without giving you what you want, what are you likely to do? Hit the machine, right?

In this example, slamming the vending machine with your hand is the *operant*—the active response you emitted. The soft drink is the *reinforcing stimulus,* or *reinforcer*—the stimulus or event that is sought in a particular situation. In everyday language, a reinforcing stimulus is typically something desirable, satisfying, or pleasant. Skinner, of course, avoided such terms because they reflected subjective emotional states.

- **law of effect** Learning principle, proposed by Thorndike, that responses followed by a satisfying effect become strengthened and are more likely to recur in a particular situation, while responses followed by a dissatisfying effect are weakened and less likely to recur in a particular situation.
- **operant** Skinner's term for an actively emitted (or voluntary) behavior that operates on the environment to produce consequences.
- **operant conditioning** The basic learning process that involves changing the probability that a response will be repeated by manipulating the consequences of that response.
- **reinforcement** The occurrence of a stimulus or event following a response that increases the likelihood of that response being repeated.

positive reinforcement A situation in which a response is followed by the addition of a reinforcing stimulus, increasing the likelihood that the response will be repeated in similar situations.

negative reinforcement A situation in which a response results in the removal of, avoidance of, or escape from a punishing stimulus, increasing the likelihood that the response will be repeated in similar situations.

primary reinforcer A stimulus or event that is naturally or inherently reinforcing for a given species, such as food, water, or other biological necessities.

conditioned reinforcer A stimulus or event that has acquired reinforcing value by being associated with a primary reinforcer; also called a *secondary reinforcer.*

Positive and Negative Reinforcement

There are two forms of reinforcement: *positive reinforcement* and *negative reinforcement.* Both affect future behavior, but they do so in different ways (see Table 5.1). It's easier to understand these differences if you note at the outset that Skinner did not use the terms *positive* and *negative* in their everyday sense of meaning "good" and "bad" or "desirable" and "undesirable." Instead, think of the words *positive* and *negative* in terms of their mathematical meanings. *Positive* is the equivalent of a plus sign (+), meaning that something is added. *Negative* is the equivalent of a minus sign (−), meaning that something is subtracted or removed. If you keep that distinction in mind, the principles of positive and negative reinforcement should be easier to understand.

Positive reinforcement involves following an operant with the addition of a reinforcing stimulus. In positive reinforcement situations, a response is strengthened because something is *added* or presented. Everyday examples of positive reinforcement in action are easy to identify. Here are some examples:

- Your backhand return of the tennis ball (the operant) is low and fast, and your tennis coach yells "Excellent!" (the reinforcing stimulus).
- You watch a student production of *Hamlet* and write a short paper about it (the operant) for 10 bonus points (the reinforcing stimulus) in your literature class.
- You reach your sales quota at work (the operant) and you get a bonus check (the reinforcing stimulus).

In each example, if the addition of the reinforcing stimulus has the effect of making you more likely to repeat the operant in similar situations in the future, then positive reinforcement has occurred.

It's important to point out that what constitutes a *reinforcing stimulus* can vary from person to person, species to species, and situation to situation. While gold stars and stickers may be reinforcing to a third-grader, they would probably have little reinforcing value to your average high school student. As Skinner (1953) explained, "The only way to tell whether or not a given event or stimulus is reinforcing to a given organism under given conditions is to make a direct test."

It's also important to note that the reinforcing stimulus is not necessarily something we usually consider positive or desirable. For example, most teachers would not think of a scolding as being a reinforcing stimulus to children. But to children, adult attention can be a powerful reinforcing stimulus. If a child receives attention from the teacher only when he misbehaves, then the teacher may unwittingly be reinforcing misbehavior. The child may actually increase disruptive behavior in order to get the sought-after reinforcing stimulus—adult attention—even if it's in the form of being scolded. To reduce the child's disruptive behavior, the teacher would do better to reinforce the child's appropriate behavior by paying attention to him when he's *not* being disruptive, such as when he is working quietly.

Negative reinforcement involves an operant that is followed by the removal of an aversive stimulus. In negative reinforcement situations, a response is strengthened because something is being *subtracted* or removed. Remember that the word *negative* in the phrase *negative reinforcement* is used like a mathematical minus sign (−).

For example, you take two aspirin (the operant) to remove a headache (the aversive stimulus). Thirty minutes later, the headache is gone. Are you now more

TABLE 5.1

Comparing Positive and Negative Reinforcement

Process	Operant Behavior	Consequence	Effect on Behavior
Positive reinforcement	Studying to make dean's list	Make dean's list	Increase studying in the future
Negative reinforcement	Studying to avoid losing academic scholarship	Avoid loss of academic scholarship	Increase studying in the future

Both positive and negative reinforcement increase the likelihood of a behavior being repeated. Positive reinforcement involves a behavior that leads to a reinforcing or rewarding event. In contrast, negative reinforcement involves behavior that leads to the avoidance of or escape from an aversive or punishing event. Ultimately, both positive and negative reinforcement involve outcomes that strengthen future behavior.



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Negative Reinforcement What behavior is being negatively reinforced? If you're having trouble answering this question, first identify the aversive stimulus.

likely to take aspirin to deal with bodily aches and pain in the future? If you are, then negative reinforcement has occurred.

Aversive stimuli typically involve physical or psychological discomfort that an organism seeks to escape or avoid. Consequently, behaviors are said to be negatively reinforced when they let you either (1) *escape* aversive stimuli that are already present or (2) *avoid* aversive stimuli before they occur. That is, we're more likely to repeat the same escape or avoidance behaviors in similar situations in the future. The headache example illustrates the negative reinforcement of *escape behavior.* By taking two aspirin, you "escaped" the headache. Paying your electric bill on time to avoid a late charge illustrates the negative reinforcement of *avoidance behavior.* Here are some more examples of negative reinforcement involving escape or avoidance behavior:

- You make backup copies of important computer files (the operant) to avoid losing the data if the computer's hard drive should fail (the aversive stimulus).
- You dab some hydrocortisone cream on an insect bite (the operant) to escape the itching (the aversive stimulus).
- You get a flu shot (the operant) in November to avoid catching the flu (the aversive stimulus).

In each example, if escaping or avoiding the aversive event has the effect of making you more likely to repeat the operant in similar situations in the future, then negative reinforcement has taken place.

Primary and Conditioned Reinforcers

Skinner also distinguished two kinds of reinforcing stimuli: primary and conditioned. A **primary reinforcer** is one that is *naturally* reinforcing for a given species. That is, even if an individual has not had prior experience with the particular stimulus, the stimulus or event still has reinforcing properties. For example, food, water, adequate warmth, and sexual contact are primary reinforcers for most animals, including humans.

A **conditioned reinforcer,** also called a *secondary reinforcer,* is one that has acquired reinforcing value by being associated with a primary reinforcer. The classic

Types of Reinforcers Primary reinforcers, like water when you're thirsty, are naturally reinforcing—you don't have to learn their value. In contrast, the value of conditioned reinforcers, like grades and awards, has to be learned through their association with primary reinforcers. But conditioned reinforcers can be just as reinforcing as primary reinforcers. As proof, snowboarder Shaun White beams as he displays one of the four Olympic gold medals he has earned for the United States.



Duomo/Corbis



Robin Utrecht/ANP/Newscom

punishment The presentation of a stimulus or event following a behavior that acts to decrease the likelihood of the behavior's being repeated.

punishment by application A situation in which an operant is followed by the presentation or addition of an aversive stimulus; also called *positive punishment.*

punishment by removal A situation in which an operant is followed by the removal or subtraction of a reinforcing stimulus; also called *negative punishment.*

example of a conditioned reinforcer is money. Money is reinforcing not because those flimsy bits of paper and little pieces of metal have value in and of themselves, but because we've learned that we can use them to acquire primary reinforcers and other conditioned reinforcers. Awards, frequent-flyer points, and college degrees are just a few other examples of conditioned reinforcers.

Conditioned reinforcers need not be as tangible as money or college degrees. The respect of your peers and the approval of your instructors or managers can be powerful conditioned reinforcers. Conditioned reinforcers can be as subtle as a smile, a touch, or a nod of recognition. Looking back at the Prologue, for example, Fern was reinforced by the laughter of her friends and relatives each time she told "the killer attic" tale—so she keeps telling the story!

Punishment

Using Aversive Consequences to Decrease Behavior

KEY THEME

› Punishment is a process that decreases the future occurrence of a behavior.

KEY QUESTIONS

› How does punishment differ from negative reinforcement?

› What factors influence the effectiveness of punishment?

› What effects are associated with the use of punishment to control behavior, and what are some alternative ways to change behavior?

› What are discriminative stimuli?

Positive and negative reinforcement are processes that *increase* the frequency of a particular behavior. The opposite effect is produced by punishment. **Punishment** is a process in which a behavior is followed by an aversive consequence that *decreases* the likelihood of the behavior's being repeated. Many people tend to confuse punishment and negative reinforcement, but these two processes produce entirely different effects on behavior (see Table 5.2). Negative reinforcement *always increases* the likelihood that an operant will be repeated in the future. Punishment *always decreases* the future performance of an operant.

Skinner (1953) identified two types of aversive events that can act as punishment. **Punishment by application,** also called *positive punishment,* involves a response being followed by the presentation of an aversive stimulus. The word *positive* in the phrase *positive punishment* signifies that something is added or presented in the situation. In this case, it's an aversive stimulus. Here are some everyday examples of punishment by application:

- An employee wears jeans to work (the operant) and is reprimanded by his supervisor for dressing inappropriately (the punishing stimulus).

TABLE 5.2

Comparing Punishment and Negative Reinforcement

Process	Operant	Consequence	Effect on Behavior
Punishment	Wear a warm but unstylish flannel shirt	A friend makes the hurtful comment, "nice shirt, whose couch did you steal to get the fabric?"	Decrease wearing the shirt in future
Negative reinforcement	Wear a warm but unstylish flannel shirt	Avoid feeling cold and uncomfortable all day	Increase wearing shirt in future

Punishment and negative reinforcement are two different processes that produce *opposite* effects on a given behavior. Punishment *decreases* the future performance of the behavior, while negative reinforcement *increases* it.

- Your dog jumps up on a visitor (the operant), and you smack him with a rolled up newspaper (the punishing stimulus).
- You make a comment (the operant) in your workgroup meetings, and a coworker responds with a sarcastic remark (the punishing stimulus).

In each of these examples, if the presentation of the punishing stimulus has the effect of decreasing the behavior it follows, then punishment has occurred. Although the punishing stimuli in these examples were administered by other people, punishing stimuli also occur as natural consequences for some behaviors. Inadvertently touching a hot iron, a live electrical wire, or a sharp object (the operant) can result in a painful injury (the punishing stimulus).

TABLE 5.3

Types of Reinforcement and Punishment

	Reinforcing stimulus	Aversive stimulus
Stimulus presented	Positive reinforcement	Positive punishment
Stimulus removed	Negative punishment	Negative reinforcement

This table provides a simple way of identifying the type of reinforcement or punishment based on whether a reinforcing or an aversive stimulus is presented or removed following an operant.

The second type of punishment is **punishment by removal,** also called *negative punishment.* The word *negative* indicates that some stimulus is subtracted or removed from the situation (see Table 5.3). In this case, it is the loss or withdrawal of a reinforcing stimulus following a behavior. That is, the behavior's consequence is the loss of some privilege, possession, or other desirable object or activity. Here are some everyday examples of punishment by removal:

- After she buys stock (the operant) in a "hot" new start-up company, the company fails and the investor loses all of her money (loss of reinforcing stimulus).
- Because he was flirting with another woman (the operant), a guy gets dumped by his girlfriend (loss of reinforcing stimulus).

In each example, if the behavior decreases in response to the removal of the reinforcing stimulus, then punishment has occurred. It's important to stress that, like reinforcement, punishment is defined by the effect it produces. In everyday usage, people often refer to a particular consequence as a punishment when, strictly speaking, it's not. Why? Because the consequence has *not* reduced future occurrences of the behavior. Hence, many consequences commonly thought of as punishments—being sent to prison, fined, reprimanded, ridiculed, or fired from a job—fail to reduce a particular behavior.

Why is it that aversive consequences don't always function as effective punishments? Skinner (1953) as well as other researchers have noted that several factors influence the effectiveness of punishment (Horner, 2002). For example, punishment is more effective if it immediately follows a response than if it is delayed. Punishment is also more effective if it consistently, rather than occasionally, follows a response (Lerman & Vorndran, 2002; Spradlin, 2002). Though speeding tickets and prison sentences are commonly referred to as punishments, these aversive consequences are inconsistently applied and often administered only after a long delay. Thus, they don't always effectively decrease specific behaviors.

Even when punishment works, its use has several drawbacks. First, punishment may decrease a specific response, but it doesn't necessarily teach or promote a more appropriate response to take its place. Second, punishment that is intense may produce undesirable results, such as complete passivity, fear, anxiety, or hostility (Lerman & Vorndran, 2002). Finally, the effects of punishment are likely to be temporary (Estes & Skinner, 1941; Skinner, 1938). A child who is sent to her room for teasing her little brother may well repeat the behavior when her mother's back is turned. As Skinner (1971) noted, "Punished behavior is likely to reappear after the punitive consequences are withdrawn." For some suggestions on how to change behavior without using a punishing stimulus, see the In Focus box, "Changing the Behavior of Others: Alternatives to Punishment."

The Effects of Spanking Defined as hitting a child on the buttocks with an open hand without causing a bruise or physical harm, *spanking* is a common form of discipline in the United States (Kazdin & Benjet, 2003). Some researchers believe that mild and occasional spanking is not necessarily harmful, especially when used as a backup for other forms of discipline (Oas, 2010).

However, many studies have demonstrated that physical punishment is associated with increased aggressiveness, delinquency, and antisocial behavior in the child (Gershoff, 2002; Knox, 2010). In one study of almost 2,500 children, those who had been spanked at age three were more likely to be more aggressive at age five (Taylor & others, 2010). Other negative effects include poor parent–child relationships and an increased risk that parental disciplinary tactics might escalate into physical abuse (Gershoff, 2002). As Skinner (1974) cautioned, gaining immediate compliance through punishment must be weighed against punishment's negative long-term effects.



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IN FOCUS

Changing the Behavior of Others: Alternatives to Punishment

Although punishment may temporarily decrease the occurrence of a problem behavior, it doesn't promote more desirable or appropriate behaviors in its place. Throughout his life, Skinner remained strongly opposed to the use of punishment. Instead, he advocated the greater use of positive reinforcement to strengthen desirable behaviors (Dinsmoor, 1992; Skinner, 1971). Here are four strategies that can be used to reduce undesirable behaviors without resorting to punishment.



AP Photo/ Chris Dorst

Using Reinforcement in the Classroom Teachers at all levels use positive reinforcement to increase desired behaviors. Often, conditioned reinforcers, like stickers or gold stars, can be exchanged for other, more tangible rewards, like a new pencil.

Strategy 1: Reinforce an Incompatible Behavior
The best method to reduce a problem behavior is to reinforce an *alternative* behavior that is both constructive and incompatible with the problem behavior. For example, if you're trying to decrease a child's whining, respond to her requests (the reinforcer) only when she talks in a normal tone of voice.

Strategy 2: Stop Reinforcing the Problem Behavior
Technically, this strategy is called *extinction*. The first step in effectively applying extinction is to observe the behavior carefully and identify the reinforcer that is maintaining the problem behavior. Then eliminate the reinforcer.

Suppose a friend keeps interrupting you while you are trying to study, asking you if you want to play a video game or just hang out. You want to extinguish his behavior of interrupting your studying. In the past, trying to be polite, you've responded to his behavior by acting interested (a reinforcer). You could eliminate the reinforcer by acting uninterested and continuing to study while he talks.

It's important to note that when the extinction process is initiated, the problem behavior often *temporarily* increases. This situation is more likely to occur if the problem behavior has only occasionally been reinforced in the past. Thus, once you begin, be consistent in nonreinforcement of the problem behavior.

Strategy 3: Reinforce the Non-Occurrence of the Problem Behavior
This strategy involves setting a specific time period after which the individual is reinforced if the unwanted behavior has *not* occurred. For example, if you're trying to reduce bickering between children, set an appropriate time limit, and then provide positive reinforcement if they have *not* squabbled during that interval.

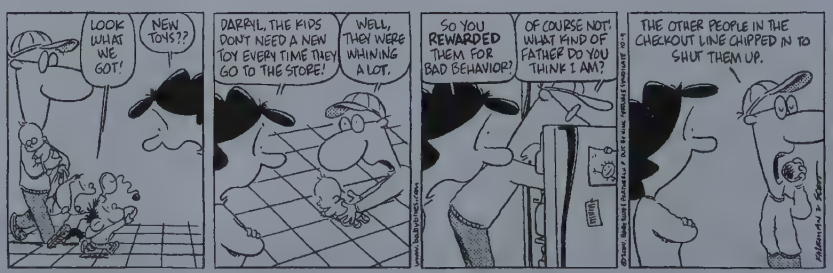
Strategy 4: Remove the Opportunity to Obtain Positive Reinforcement
It's not always possible to identify and eliminate all the reinforcers that maintain a behavior. For example, a child's obnoxious behavior might be reinforced by the social attention of siblings or classmates.

In a procedure called *time-out from positive reinforcement*, the child is removed from the reinforcing situation for a short time, so that the access to reinforcers is eliminated. When the undesirable behavior occurs, the child is immediately sent to a time-out area that is free of distractions and social contact. The time-out period begins as soon as the child's behavior is under control. For children, a good rule of thumb is one minute of time-out per year of age.

Enhancing the Effectiveness of Positive Reinforcement

Often, these four strategies are used in combination. However, remember the most important behavioral principle: *Positively reinforce the behaviors that you want to increase.* There are several ways in which you can enhance the effectiveness of positive reinforcement:

- Make sure that the reinforcer is *strongly* reinforcing to the individual whose behavior you're trying to modify.
- The positive reinforcer should be delivered *immediately* after the preferred behavior occurs.
- The positive reinforcer should initially be given *every* time the preferred behavior occurs. When the desired behavior is well established, *gradually reduce the frequency of reinforcement.*
- Use a *variety* of positive reinforcers, such as tangible items, praise, special privileges, recognition, and so on. Minimize the use of food as a positive reinforcer.
- Capitalize on what is known as the *Premack principle*—a more preferred activity (e.g., painting) can be used to reinforce a less preferred activity (e.g., picking up toys).
- Encourage the individual to engage in *self-reinforcement* in the form of pride, a sense of accomplishment, and feelings of self-control.



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Discriminative Stimuli

Setting the Occasion for Responding

discriminative stimulus A specific stimulus in the presence of which a particular response is more likely to be reinforced, and in the absence of which a particular response is not likely to be reinforced.

Another component of operant conditioning is the **discriminative stimulus**—the specific stimulus in the presence of which a particular operant is more likely to be reinforced. For example, a ringing phone is a discriminative stimulus that sets the occasion for a particular response—picking up the telephone and speaking.

This example illustrates how we've learned from experience to associate certain environmental cues or signals with particular operant responses. We've learned that we're more likely to be reinforced for performing a particular operant response when we do so in the presence of the appropriate discriminative stimulus. Thus, you've learned that you're more likely to be reinforced for screaming at the top of your lungs at a football game (one discriminative stimulus) than in the middle of class (a different discriminative stimulus).

In this way, according to Skinner (1974), behavior is determined and controlled by the stimuli that are present in a given situation. In Skinner's view, an individual's behavior is *not* determined by a personal choice or a conscious decision. Instead, individual behavior is determined by environmental stimuli and the person's reinforcement history in that environment. Skinner's views on this point have some very controversial implications, which are discussed in the Critical Thinking box, "Is Human Freedom Just an Illusion?"

We have now discussed all three fundamental components of operant conditioning (see Table 5.4). In the presence of a specific environmental stimulus (the *discriminative stimulus*), we emit a particular behavior (the *operant*), which is followed by a consequence (*reinforcement* or *punishment*). If the consequence is either positive or negative reinforcement, we are *more* likely to repeat the operant when we encounter the same or similar discriminative stimuli in the future. If the consequence is some form of punishment, we are *less* likely to repeat the operant when we encounter the same or similar discriminative stimuli in the future.

Next, we'll build on the basics of operant conditioning by considering how Skinner explained the acquisition of complex behaviors.

TABLE 5.4

Components of Operant Conditioning

The examples given here illustrate the three key components involved in operant conditioning. The basic operant conditioning process works like this: In the presence of a specific discriminative stimulus, an operant response is emitted, which is followed by a consequence. Depending on the consequence, we are either more or less likely to repeat the operant when we encounter the same or a similar discriminative stimulus in the future.

	Discriminative Stimulus	Operant Response	Consequence	Effect on Future Behavior
Definition	The environmental stimulus that precedes an operant response	The actively emitted or voluntary behavior	The environmental stimulus or event that follows the operant response	Reinforcement increases the likelihood of operant being repeated; punishment or lack of reinforcement decreases the likelihood of operant being repeated.
Examples	Wallet on college sidewalk	Give wallet to security	$50 reward from wallet's owner	Positive reinforcement: More likely to turn in lost items to authorities
	Gas gauge almost on "empty"	Fill car with gas	Avoid running out of gas	Negative reinforcement: More likely to fill car when gas gauge shows empty
	Informal social situation at work	Tell an off-color, sexist joke	Formally reprimanded for sexism and inappropriate workplace behavior	Positive punishment: Less likely to tell off-color, sexist jokes in workplace
	Soft-drink vending machine	Put in quarters	Get no soft drink and lose money	Negative punishment: Less likely to use that vending machine

CRITICAL THINKING

Is Human Freedom Just an Illusion?

Skinner was intensely interested in human behavior and social problems (Bjork, 1997). He believed that operant conditioning principles could, and *should*, be applied on a broad scale to help solve society's problems. Skinner's most radical—and controversial—belief was that such ideas as free will, self-determination, and individual choice are just illusions.

Skinner (1971) argued that behavior is not simply influenced by the environment but is *determined* by it. Control the environment, he said, and you will control human behavior. As he bluntly asserted in his controversial best-seller, *Beyond Freedom and Dignity* (1971), "A person does not act upon the world, the world acts upon him."

Such views did not sit well with the American public (Rutherford, 2003). Following the publication of *Beyond Freedom and Dignity*, one member of Congress denounced Skinner for "advancing ideas which threaten the future of our system of government by denigrating the American tradition of individualism, human dignity, and self-reliance" (quoted in Rutherford, 2000). Why the uproar?

Skinner's ideas clashed with the traditional American ideals of personal responsibility, individual freedom, and self-determination. Such ideals are based on the assumption that behavior arises from causes that are *within* the individual. All individuals are held responsible for their conduct and given credit for their achievements. Skinner labeled such notions the "traditional prescientific view" of human behavior.

According to Skinner, "A scientific analysis [of behavior] shifts both the responsibility and the achievement to the environment." Applying his ideas to social problems, such as alcoholism and crime, Skinner (1971) wrote, "It is the environment which is 'responsible' for objectionable behavior, and it is the environment, not some attribute of the individual, which must be changed."

To understand Skinner's point of view, it helps to think of society as a massive, sophisticated Skinner box. From the moment of birth, the environment shapes and determines your behavior through reinforcing or punishing consequences. Taking this view, you are no more personally responsible for your behavior than is a rat in a Skinner box pressing a lever to obtain a food pellet. Just like the rat's behavior, your behavior is simply a response to the unique patterns of environmental consequences to which you have been exposed. On the one hand, it may seem convenient to blame your history of environmental consequences for your failures and mistakes. On the other hand, that means you can't take any credit for your accomplishments and good deeds, either!

Skinner (1971) proposed that "a technology of behavior" be developed, one based on a scientific analysis of behavior. He believed that society could be redesigned using operant conditioning principles to produce more socially desirable behaviors—and happier citizens. He described such an ideal, utopian society in *Walden Two*, a novel he published in 1948.

Critics charged Skinner with advocating a totalitarian state. They asked who would determine which behaviors were shaped and maintained (Rutherford, 2000; Todd & Morris, 1992). As Skinner pointed out, however, human behavior is *already* controlled by various authorities: parents, teachers, politicians, religious leaders, employers, and so forth. Such authorities regularly use reinforcing and punishing consequences to shape and control the behavior of others. Skinner insisted that it is better to control behavior in a rational, humane fashion than to leave the control of behavior to the whims and often selfish aims of those in power.



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Time for Skinner's Ideas? The impact of the publication of *Beyond Freedom and Dignity* can be measured by Skinner's appearance on the cover of *Time* on September 20, 1971, shortly after the book was published. Skinner is shown in the middle of some of his most famous creations. Clockwise from upper left: pigeons trained to peck at a ping-pong ball; a rat pressing a lever in an operant chamber; an idealized rural scene representing the fictional utopia described in Skinner's novel *Walden Two* (1948a); and a teaching machine, an early mechanical device for programmed instruction based on operant conditioning principles.

Skinner's ideas may seem radical or far-fetched. But some contemporary thinkers are already developing new ideas about how operant conditioning principles can be used to meet socially desirable goals. A movement called *gamification* advocates turning daily life into a kind of virtual reality game, in which "points" or other conditioned reinforcers are awarded to reward healthy or productive behaviors (Campbell, 2011). For example, some businesses give reductions on health insurance premiums to employees that rack up enough points on a specially equipped pedometer that monitors their daily activity level. The danger? Marketing professionals are already studying ways to use gamification to influence consumer preferences and buying decisions (Schell, 2010).

CRITICAL THINKING QUESTIONS

- If Skinner's vision of a socially engineered society using operant conditioning principles were implemented, would such changes be good or bad for society?
- Are human freedom and personal responsibility illusions? Or is human behavior fundamentally different from a rat's behavior in a Skinner box? If so, how?
- Is your behavior almost entirely the product of environmental conditioning? Think about your answer carefully. After all, exactly *why* are you reading this box?



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CONCEPT REVIEW 5.2

Reinforcement and Punishment

Identify the operant conditioning process that is being illustrated in each of the following examples. Choose from: positive reinforcement, negative reinforcement, punishment by application, and punishment by removal.

1. When Joan turns the grocery cart down the candy aisle, her three-year-old son, Connor, starts screaming, "Want candy! Candy!" Joan moves to another aisle, but Connor continues to scream. As other customers begin staring and Joan starts to feel embarrassed, she finally gives Connor a bag of M&Ms. Connor is now more likely to scream in a store when he wants candy because he has experienced _____.
2. If Joan is more likely to give in to Connor's temper tantrums in public situations in the future, it is because she has experienced _____.
3. Feeling sorry for a hitchhiker on the side of the road, Howard offered him a ride. The hitchhiker robbed Howard and stole his car. Howard no longer picks up hitchhikers because of _____.
4. Jacob is caught surfing X-rated Web sites on the computer in his office and gets reprimanded by his boss. Jacob no longer accesses X-rated Web sites on his office computer because of _____.
5. As you walk out of the shoe store at the Super Mall and turn toward another store, you spot a person whom you greatly dislike. You immediately duck back into the shoe store to avoid an unpleasant interaction with him. Because _____ has occurred, you are more likely to take evasive action when you encounter people you dislike in the future.
6. Having watched her favorite cartoon characters, the Powerpuff Girls, fly into the air on many episodes, four-year-old Tracey confidently climbs a stepladder, then launches herself into the air, only to tumble onto the grass. Because Tracey experienced _____, she tried this stunt only once.
7. Thinking she was making a good impression in her new job by showing how knowledgeable she was, Tanya corrected her supervisor's erroneous comments in two different meetings. Not long after the second meeting, Tanya was "let go" because of her bad attitude. Because she experienced _____, Tanya no longer publicly corrects her superiors.

Shaping and Maintaining Behavior

KEY THEME

› New behaviors are acquired through shaping and can be maintained through different patterns of reinforcement.

KEY QUESTIONS

› How does shaping work?

› What is the partial reinforcement effect, and how do the four schedules of reinforcement differ in their effects?

› What is behavior modification?

operant chamber or **Skinner box** The experimental apparatus invented by B. F. Skinner to study the relationship between environmental events and active behaviors.

shaping The operant conditioning procedure of selectively reinforcing successively closer approximations of a goal behavior until the goal behavior is displayed.

To scientifically study the relationship between behavior and its consequences in the laboratory, Skinner invented the **operant chamber,** more popularly known as the **Skinner box.** An operant chamber is a small cage with a food dispenser. Attached to the cage is a device that automatically records the number of operants made by an experimental animal, usually a rat or pigeon. For a rat, the typical operant is pressing a bar; for a pigeon, it is pecking at a small disk. Food pellets are usually used for positive reinforcement. Often, a light in the cage functions as a discriminative stimulus. When the light is on, pressing the bar or pecking the disk is reinforced with a food pellet. When the light is off, these responses do not result in reinforcement.

When a rat is first placed in a Skinner box, it typically explores its new environment, occasionally nudging or pressing the bar in the process. The researcher can accelerate the rat's bar-pressing behavior through a process called shaping. **Shaping** involves reinforcing successively closer approximations of a behavior until the correct behavior is displayed. For example, the researcher might first reinforce the rat with a food pellet whenever it moves to the half of the Skinner box in which the bar is located. Other responses would be ignored. Once that response has been learned, reinforcement is withheld until the rat moves even closer to the bar. Then the rat might be reinforced only when it touches the bar. Step by step, the rat is reinforced for behaviors that correspond ever more closely to the final goal behavior—pressing the bar.



Time & Life Pictures/ Getty Images

The Skinner Box Popularly called a Skinner box after its inventor, an operant chamber is used to experimentally study operant conditioning in laboratory animals.



Courtesy of the Authors

Operant Conditioning at SeaWorld This sequence shows a SeaWorld trainer using operant conditioning principles with a dolphin that has already been shaped to perform somersaults. **(a)** The trainer gives the dolphin two discriminative stimuli—a distinct vocal sound and a specific hand gesture. **(b)** The dolphin quickly responds with the correct operant—a perfect somersault in the air. **(c)** The operant is positively reinforced with a piece of fish. The same basic techniques are also used to teach seals, sea lions, walruses, and killer whales to perform different tricks on cue.

continuous reinforcement A schedule of reinforcement in which every occurrence of a particular response is followed by a reinforcer.

partial reinforcement A situation in which the occurrence of a particular response is only sometimes followed by a reinforcer.

extinction (in operant conditioning) The gradual weakening and disappearance of conditioned behavior. In operant conditioning, extinction occurs when an emitted behavior is no longer followed by a reinforcer.

partial reinforcement effect The phenomenon in which behaviors that are conditioned using partial reinforcement are more resistant to extinction than behaviors that are conditioned using continuous reinforcement.

Skinner believed that shaping could explain how people acquire a wide variety of abilities and skills—everything from tying shoes to operating sophisticated computer programs. Athletic coaches, teachers, parents, and child-care workers all use shaping techniques.

The Partial Reinforcement Effect

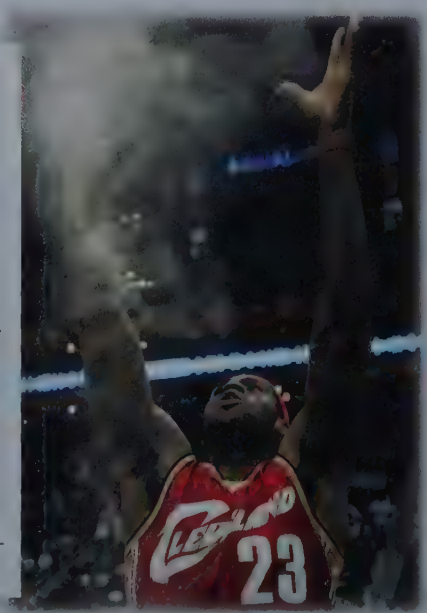
Building Resistance to Extinction

Once a rat had acquired a bar-pressing behavior, Skinner found that the most efficient way to strengthen the response was to immediately reinforce *every* occurrence of bar pressing. This pattern of reinforcement is called **continuous reinforcement.** In everyday life, of course, it's common for responses to be reinforced only sometimes—a pattern called **partial reinforcement.** For example, practicing your basketball skills isn't followed by putting the ball through the hoop on every shot. Sometimes you're reinforced by making a basket, and sometimes you're not.

Now suppose that despite all your hard work, your basketball skills are dismal. If practicing free throws was *never* reinforced by making a basket, what would you do? You'd probably eventually quit playing basketball. This is an example of **extinction.** In operant conditioning, when a learned response no longer results in reinforcement, the likelihood of the behavior's being repeated gradually declines.

Skinner (1956) first noticed the effects of partial reinforcement when he began running low on food pellets one day. Rather than reinforcing every bar press, Skinner tried to stretch out his supply of pellets by rewarding responses only periodically. He found that the rats only continued to respond, but actually increased their rate of bar pressing.

One important consequence of partially reinforcing behavior is that partially reinforced behaviors tend to be more resistant to extinction than are behaviors conditioned using continuous reinforcement. This phenomenon is called the **partial reinforcement effect.**



AP Photo/John Amis

Superstitious Rituals: Behaviors Shaped by Accidental Reinforcement LeBron James is one of the many professional athletes who has developed a superstitious pre-game routine (Wargo, 2008). Basketball fans are familiar with "The Ritual," a complex sequence that includes carefully choreographed handshakes with teammates and culminates with James tossing chalk high into the air in front of cheering (or jeering) spectators. "It's just part of his game-day structure," says Mike Mancias, assistant athletic trainer for James's old team, the Cavaliers. "If one thing is off . . . it can throw him off" (Hamill, 2010).

Skinner (1948b) pointed out that superstitions may result when a behavior is accidentally reinforced—that is, when reinforcement is just a coincidence. So although it was really just a fluke that wearing your "lucky" shirt or playing your "lucky" number was followed by a win, the illusion of reinforcement can shape and strengthen behavior.

For example, when Skinner shut off the food-dispensing mechanism, a pigeon conditioned using continuous reinforcement would continue pecking at the disk 100 times or so before the behavior decreased significantly, indicating extinction. In contrast, a pigeon conditioned with partial reinforcement continued to peck at the disk thousands of times! If you think about it, this is not surprising. When pigeons, rats, or humans have experienced partial reinforcement, they've learned that reinforcement may yet occur, despite delays and nonreinforced responses, if persistent responses are made.

In everyday life, the partial reinforcement effect is reflected in behaviors that persist despite the lack of reinforcement. Gamblers may persist despite a string of losses, writers will persevere in the face of repeated rejection slips, and the family dog will continue begging for the scraps of food that it has only occasionally received at the dinner table in the past.

The Schedules of Reinforcement

Skinner (1956) found that specific preset arrangements of partial reinforcement produced different patterns and rates of responding. Collectively, these different reinforcement arrangements are called **schedules of reinforcement.** As we describe the four basic schedules of reinforcement, it will be helpful to refer to Figure 5.6, which shows the typical pattern of responses produced by each schedule.

With a **fixed-ratio (FR) schedule,** reinforcement occurs after a fixed number of responses. A rat on a 10-to-1 fixed-ratio schedule (abbreviated FR-10) would have to press the bar 10 times in order to receive one food pellet. Fixed-ratio schedules typically produce a high rate of responding that follows a burst–pause–burst pattern. In everyday life, the fixed-ratio schedule is reflected in any activity that requires a precise number of responses in order to obtain reinforcement. Piecework—work for which you are paid for producing a specific number of items, such as being paid $1 for every 100 envelopes you stuff—is an example of an FR-100 schedule.

With a **variable-ratio (VR) schedule,** reinforcement occurs after an *average* number of responses, which *varies* from trial to trial. A rat on a variable-ratio-20 schedule (abbreviated VR-20) might have to press the bar 25 times on the first trial before being reinforced and only 15 times on the second trial before reinforcement. Although the number of responses required on any specific trial is *unpredictable,* over repeated trials the ratio of responses to reinforcers works out to the predetermined average.

Variable-ratio schedules of reinforcement produce high, steady rates of responding with hardly any pausing between trials or after reinforcement. Gambling is the classic example of a variable-ratio schedule in real life. Each spin of the roulette wheel, toss of the dice, or purchase of a lottery ticket could be the big one, and the more often you gamble, the more opportunities you have to win (and lose, as casino owners are well aware).

On a **fixed-interval (FI) schedule,** a reinforcer is delivered for the first response emitted *after* the preset time interval has elapsed. A rat on a two-minute fixed-interval schedule (abbreviated FI-2 minutes) would receive no food pellets for any bar presses made during the first two minutes. But the first bar press *after* the two-minute interval had elapsed would be reinforced.

Fixed-interval schedules typically produce a scallop-shaped pattern of responding in which the number of responses tends to increase as the time for the next reinforcer draws near. For example, if your instructor gives you a test every four weeks, your studying behavior would probably follow the same scallop-shaped pattern of responding as the rat's bar-pressing behavior. As the end of the four-week interval draws near, studying behavior increases. After the test, studying behavior drops off until the end of the next four-week interval approaches.

On a **variable-interval (VI) schedule,** reinforcement occurs for the first response emitted after an *average* amount of

schedule of reinforcement The delivery of a reinforcer according to a preset pattern based on the number of responses or the time interval between responses.

fixed-ratio (FR) schedule A reinforcement schedule in which a reinforcer is delivered after a fixed number of responses has occurred.

variable-ratio (VR) schedule A reinforcement schedule in which a reinforcer is delivered after an average number of responses, which varies unpredictably from trial to trial.

fixed-interval (FI) schedule A reinforcement schedule in which a reinforcer is delivered for the first response that occurs after a preset time interval has elapsed.

variable-interval (VI) schedule A reinforcement schedule in which a reinforcer is delivered for the first response that occurs after an average time interval, which varies unpredictably from trial to trial.

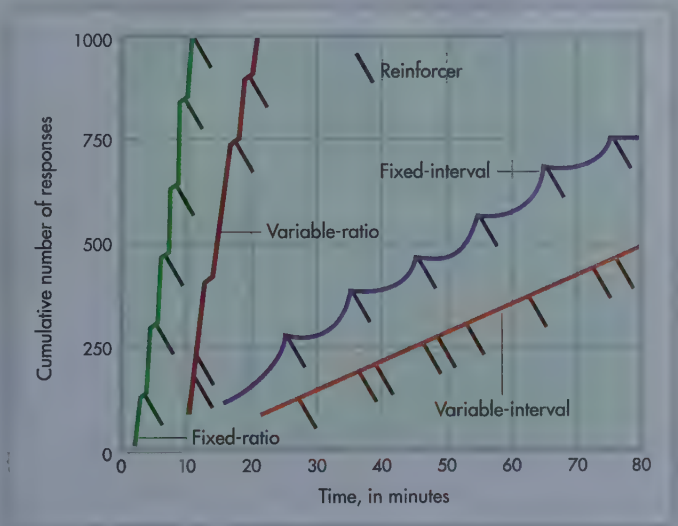


FIGURE 5.6 Schedules of Reinforcement and Response Patterns Different patterns of responding are produced by the four basic schedules of reinforcement. The predictable nature of a *fixed-ratio schedule* (the green line at far left) produces a high rate of responding, with a pause after the reinforcer is delivered. The unpredictable nature of *variable-ratio schedules* (red) also produces high, steady rates of responding, but with hardly any pausing between reinforcers. *Fixed-interval schedules* (purple) produce a scallop-shaped pattern of responding. The unpredictable nature of *variable-interval schedules* (orange) produces a moderate but steady rate of responding. (Based on Skinner, 1961.)

behavior modification The application of learning principles to help people develop more effective or adaptive behaviors.

time has elapsed, but the interval varies from trial to trial. Hence, a rat on a VI-30 seconds schedule might be reinforced for the first bar press after only 10 seconds have elapsed on the first trial, for the first bar press after 50 seconds have elapsed on the second trial, and for the first bar press after 30 seconds have elapsed on the third trial. This works out to an average of one reinforcer every 30 seconds.

Generally, the unpredictable nature of variable-interval schedules tends to produce moderate but steady rates of responding, especially when the average interval is relatively short. In daily life, we experience variable-interval schedules when we have to wait for events that follow an approximate, rather than a precise, schedule. For example, parents often unwittingly reinforce a whining child on a variable interval schedule. From the child's perspective, the whining usually results in the desired request, but how long the child has to whine before getting reinforced can vary. Thus, the child learns that persistent whining will eventually pay off.

Applications of Operant Conditioning

The In Focus box on alternatives to punishment earlier in the chapter described how operant conditioning principles can be applied to reduce and eliminate problem behaviors. These examples illustrate **behavior modification,** the application of learning principles to help people develop more effective or adaptive behaviors. Most often, behavior modification involves applying the principles of operant conditioning to bring about changes in behavior.

Behavior modification techniques have been successfully applied in many different settings (see Kazdin, 2008). Coaches, parents, teachers, and employers all routinely use operant conditioning. For example, behavior modification has been used to reduce public smoking by teenagers (Jason & others, 2009), improve student behavior in school cafeterias (McCurdy & others, 2009), reduce problem behaviors in school children (Dunlap & others, 2010; Schanding & Sterling-Turner, 2010), and improve social skills and reduce self-destructive behaviors in people with autism and related disorders (Makrygianni & Reed, 2010).

Businesses also use behavior modification. For example, one large retailer increased productivity by allowing employees to choose their own reinforcers. A casual dress code and flexible work hours proved to be more effective reinforcers than money (Raj & others, 2006). In each of these examples, the systematic use of reinforcement, shaping, and extinction increased the occurrence of desirable behaviors and decreased the incidence of undesirable behaviors. In Chapter 15, on therapies, we'll look at behavior modification techniques in more detail.



Jim Bourg/ Reuters

Creating "Helping Hands" with Operant Conditioning
Founded by behavioral psychologist Mary Joan Willard, "Helping Hands" is a nonprofit organization that uses operant conditioning to train capuchin monkeys to provide live-in help to people who are paralyzed or otherwise severely disabled. Capuchins are used because of their high intelligence, dexterity, and ability to form a close bond with their human companions. At the Helping Hands "monkey college" near Boston, capuchins are trained to perform a wide range of helping behaviors, such as turning on lights, combing a person's hair, and loading a CD or DVD. Training can take up to two years. Shown is Toby, a 10-year-old capuchin monkey, as he retrieves a bottle from inside a closed refrigerator for his trainer.

The principles of operant conditioning have also been used in the specialized training of animals, such as the capuchin monkey shown on the previous page, to help people who are physically challenged. Other examples are Seeing Eye dogs and dogs who assist people who are hearing-impaired.

CONCEPT REVIEW 5.3

Schedules of Reinforcement

Indicate which of the following schedules of reinforcement is being used for each example: variable interval (VI); fixed interval (FI); variable ratio (VR); fixed ratio (FR).

1. _____ A data entry clerk is paid $1 for every 100 correct accounting entries made on the computer.
2. _____ At the beginning of the new term, your instructor announces that there will be five surprise quizzes over the course of the semester.
3. _____ At the beginning of the semester, your instructor announces that there will be a test every two weeks.
4. _____ On average, the campus shuttle bus passes the library about once every hour.
5. _____ Michael loves to play the slot machines, and, occasionally, he wins.
6. _____ Miguel works 40 hours a week in an office and gets paid every Friday afternoon.

Contemporary Views of Operant Conditioning

KEY THEME

› In contrast to Skinner, today's psychologists acknowledge the importance of both cognitive and evolutionary factors in operant conditioning.

KEY QUESTIONS

› How did Tolman's research demonstrate the involvement of cognitive processes in learning?

› What are cognitive maps, latent learning, and learned helplessness?

› How do an animal's natural behavior patterns affect the conditioning of operant behaviors?

In our discussion of classical conditioning, we noted that contemporary psychologists acknowledge the important roles played by cognitive factors and biological predispositions in classical conditioning. The situation is much the same with operant conditioning. The basic principles of operant conditioning have been confirmed in thousands of studies. However, our understanding of operant conditioning has been broadened by the consideration of cognitive factors and the recognition of the importance of natural behavior patterns.

Cognitive Aspects of Operant Conditioning

Rats! I Thought *You* Had the Map!

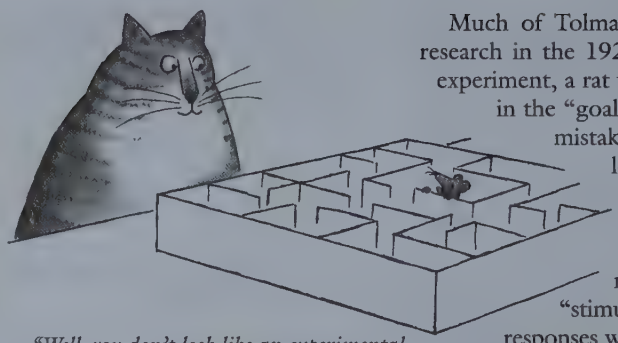
In Skinner's view, operant conditioning did not need to invoke cognitive factors to explain the acquisition of operant behaviors. Words such as *expect, prefer, choose,* and *decide* could not be used to explain how behaviors were acquired, maintained, or extinguished. Similarly, Thorndike and other early behaviorists believed that complex, active behaviors were no more than a chain of stimulus–response connections that had been "stamped in" by their effects.

However, not all learning researchers agreed with Skinner and Thorndike. **Edward C. Tolman** firmly believed that cognitive processes played an important role in the learning of complex behaviors—even in the lowly laboratory rat. According to Tolman, although such cognitive processes could not be observed directly, they could still be experimentally verified and inferred by careful observation of outward behavior (Tolman, 1932).



Edward Chace Tolman (1898–1956)
Although he looks rather solemn in this photo, Tolman was known for his openness to new ideas, energetic teaching style, and playful sense of humor. During an important speech, he showed a film of a rat in a maze with a short clip from a Mickey Mouse cartoon spliced in at the end (Gleitman, 1991). Tolman's research demonstrated that cognitive processes are an important part of learning, even in the rat.

Archives of the History of American Psychology. The University of Akron



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"Well, you don't look like an experimental psychologist to me."

Much of Tolman's research involved rats in mazes. When Tolman began his research in the 1920s, many studies of rats in mazes had been done. In a typical experiment, a rat would be placed in the "start" box. A food reward would be put in the "goal" box at the end of the maze. The rat would initially make many mistakes in running the maze. After several trials, it would eventually learn to run the maze quickly and with very few errors.

But what had the rats learned? According to traditional behaviorists, the rats had learned a *sequence of responses,* such as "first corner—turn left; second corner—turn left; third corner—turn right," and so on. Each response was associated with the "stimulus" of the rat's position in the maze. And the entire sequence of responses was "stamped in" by the food reward at the end of the maze.

Tolman (1948) disagreed with that view. He noted that several investigators had reported as incidental findings that their maze-running rats had occasionally taken their own shortcuts to the food box. In one case, an enterprising rat had knocked the cover off the maze, climbed over the maze wall and out of the maze, and scampered directly to the food box (Lashley, 1929; Tolman & others, 1946). To Tolman, such reports indicated that the rats had learned more than simply the sequence of responses required to get to the food. Tolman believed instead that the rats eventually built up, through experience, a **cognitive map** of the maze—a mental representation of its layout.

As an analogy, think of the route you typically take to get to your psychology classroom. If a hallway along the way were blocked off for repairs, you would use your cognitive map of the building to come up with an alternative route to class. Tolman showed experimentally that rats, like people, seem to form cognitive maps (Tolman, 1948). And, like us, rats can use their cognitive maps to come up with an alternative route to a goal when the customary route is blocked (Tolman & Honzik, 1930a).

Tolman challenged the prevailing behaviorist model on another important point. According to Thorndike, for example, learning would not occur unless the behavior was "strengthened," or "stamped in," by a rewarding consequence. But Tolman showed that this was not necessarily the case. In a classic experiment, three groups of rats were put in the same maze once a day for several days (Tolman & Honzik, 1930b). For group 1, a food reward awaited the rats at the end of the maze. Their performance in the maze steadily improved; the number of errors and the time it took the rats to reach the goal box showed a steady decline with each trial. The rats in group 2 were placed in the maze each day with *no* food reward. They consistently made many errors, and their performance showed only slight improvement. The performance of the rats in groups 1 and 2 was exactly what the traditional behaviorist model would have predicted.

Now consider the behavior of the rats in group 3. These rats were placed in the maze with no food reward for the first 10 days of the experiment. Like the rats in group 2, they made many errors as they wandered about the maze. But, beginning on day 11, they received a food reward at the end of the maze. As you can see in Figure 5.7, there was a dramatic improvement in group 3's performance from day 11 to day 12. Once the rats had discovered that food awaited them at the end of the maze, they made a beeline for the goal. On day 12, the rats in group 3 ran the maze with very few errors, improving their performance to the level of the rats in group 1 that had been rewarded on every trial!

Tolman concluded that *reward*—or reinforcement—is *not necessary* for learning to take place (Tolman & Honzik, 1930b). The rats in group 3 had learned the layout of the maze and formed a cognitive map of the maze simply by exploring it for 10 days. However, they had not been motivated to *demonstrate* that learning until a reward was introduced. Rewards, then, seem to affect the *performance* of what has been learned rather than learning itself. To describe learning that is not immediately demonstrated in overt behavior, Tolman used the term **latent learning.**

From these and other experiments, Tolman concluded that learning involves the acquisition of knowledge rather than simply changes in outward behavior. According

cognitive map Tolman's term for the mental representation of the layout of a familiar environment.

latent learning Tolman's term for learning that occurs in the absence of reinforcement but is not behaviorally demonstrated until a reinforcer becomes available.

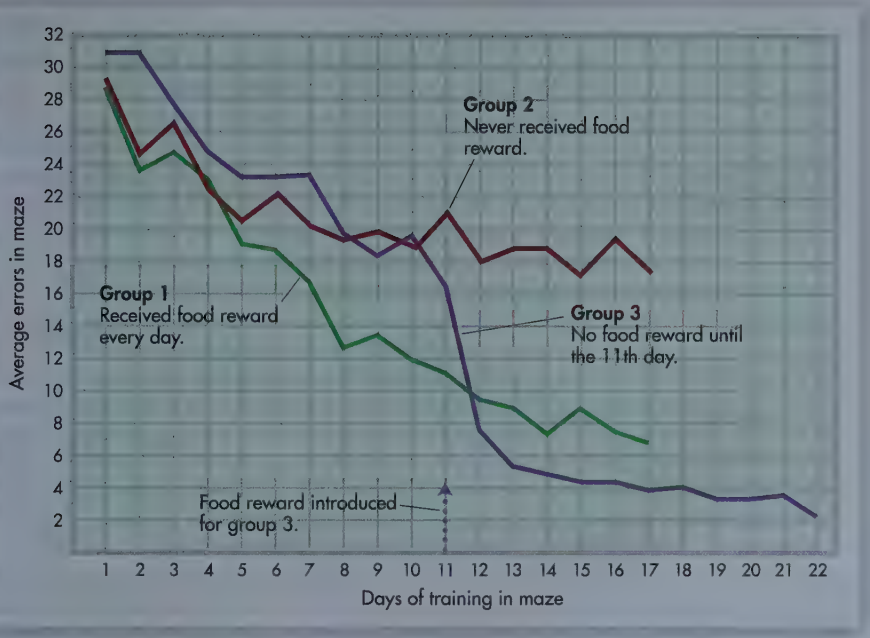


FIGURE 5.7 Latent Learning Beginning with day 1, the rats in group 1 received a food reward at the end of the maze, and the number of errors they made steadily decreased each day. The rats in group 2 never received a food reward; they made many errors as they wandered about in the maze. The rats in group 3 did not receive a food reward on days 1 through 10. Beginning on day 11, they received a food reward at the end of the maze. Notice the sharp decrease in errors on day 12 and thereafter. According to Tolman, the rats in group 3 had formed a cognitive map of the maze during the first 11 days of the experiment. Learning had taken place, but this learning was not demonstrated until reinforcement was present—a phenomenon that Tolman called latent learning.

Source: Tolman & Honzik (1930b).

to Tolman (1932), an organism essentially learns "what leads to what." It learns to "expect" that a certain behavior will lead to a particular outcome in a specific situation.

Tolman is now recognized as an important forerunner of modern cognitive learning theorists (Gleitman, 1991; Olton, 1992). Many contemporary cognitive learning theorists follow Tolman in their belief that operant conditioning involves the *cognitive representation* of the relationship between a behavior and its consequence. Today, operant conditioning is seen as involving the cognitive *expectancy* that a given consequence will follow a given behavior (Bouton, 2007; Dickinson & Balleine, 2000).

Learned Helplessness

Expectations of Failure and Learning to Quit

Cognitive factors, particularly the role of expectation, are involved in another learning phenomenon, called *learned helplessness*. Learned helplessness was discovered by accident. Psychologists were trying to find out if classically conditioned responses would affect the process of operant conditioning in dogs. The dogs were strapped into harnesses and then exposed to a tone (the neutral stimulus) paired with an unpleasant but harmless electric shock (the UCS), which elicited fear (the UCR). After conditioning, the tone alone—now a CS—elicited the conditioned response of fear.

In the classical conditioning setup, the dogs were unable to escape or avoid the shock. But the next part of the experiment involved an operant conditioning procedure in which the dogs *could* escape the shock. The dogs were transferred to a special kind of operant chamber called a *shuttlebox*, which has a low barrier in the middle that divides the chamber in half. In the operant conditioning setup, the floor on one side of the cage became electrified. To escape the shock, all the dogs had to do was learn a simple escape behavior: Jump over the barrier when the floor was electrified. Normally, dogs learn this simple operant very quickly.

However, when the classically conditioned dogs were placed in the shuttlebox and one side became electrified, the dogs did *not* try to jump over the barrier. Rather than perform the operant to escape the shock, they just lay down and whined. Why?

To Steven F. Maier and **Martin Seligman,** two young psychology graduate students at the time, the explanation of the dogs' passive behavior seemed obvious. During the tone–shock pairings in the classical conditioning setup, the dogs *had learned that shocks*



Martin E. P. Seligman: From Learned Helplessness to Positive Psychology

Seligman (b. 1942) began his research career by studying learned helplessness in dogs, and later, in humans. He applied his findings to psychological problems in humans, including depression. He also investigated why some people succumb to learned helplessness while others persist in the face of obstacles. Seligman (1991, 2005) eventually developed a program to teach "learned optimism" as a way of overcoming feelings of helplessness, habitual pessimism, and depression. Elected president of the American Psychological Association in 1996, Seligman launched a new movement called positive psychology, which would emphasize research on human strengths, rather than human problems. As Seligman (2004) explained, "It became my mission in life to help create a positive psychology whose mission would be the understanding and building of positive emotion, of strength and virtue, and of positive institutions."

Courtesy of The Positive Psychology Center

were inescapable. No active behavior that they engaged in—whether whining, barking, or struggling in the harness—would allow them to avoid or escape the shock. In other words, the dogs had "learned" to be helpless: They had developed the *cognitive expectation* that their behavior would have no effect on the environment.

To test this idea, Seligman and Maier (1967) designed a simple experiment. Dogs were arranged in groups of three. The first dog received shocks that it could escape by pushing a panel with its nose. The second dog was "yoked" to the first and received the same number of shocks. However, nothing the second dog did could stop the shock—they stopped only if the first dog pushed the panel. The third dog was the control and got no shocks at all.

After this initial training, the dogs were transferred to the shuttlebox. As Seligman and Maier had predicted, the first and third dogs quickly learned to jump over the barrier when the floor became electrified. But the second dog, the one that had learned that nothing it did would stop the shock, made no effort to jump over the barrier. Because the dog had developed the cognitive expectation that its behavior would have no effect on the environment, it had become passive (Seligman & Maier, 1967). The name of this phenomenon is **learned helplessness**—a phenomenon in which exposure to inescapable and uncontrollable aversive events produces passive behavior (Maier & others, 1969).

Since these early experiments, learned helplessness has been demonstrated in many different species, including primates, cats, rats, and fish (LoLordo, 2001). Even cockroaches demonstrate learned helplessness in a cockroach-sized shuttlebox after being exposed to inescapable shock (G. E. Brown & others, 1999).

In humans, numerous studies have found that exposure to uncontrollable, aversive events can produce passivity and learned helplessness. For example, college students who have experienced failure in previous academic settings may feel that academic tasks and setbacks are beyond their control. Thus, when faced with the demands of exams, papers, and studying, rather than rising to the challenge, they may experience feelings of learned helplessness (Au & others, 2010). If a student believes that academic tasks are unpleasant, unavoidable, and beyond her control, even the slightest setback can trigger a sense of helpless passivity. Such students may be prone to engage in self-defeating responses, such as procrastinating or giving up prematurely.

How can learned helplessness be overcome? In their early experiments, Seligman and Maier discovered that if they forcibly dragged the dogs over the shuttlebox barrier when the floor on one side became electrified, the dogs would eventually overcome their passivity and begin to jump over the barrier on their own (LoLordo, 2001; Seligman, 1992). For students who experience academic learned helplessness, establishing a sense of control over their school-work is the first step. Seeking knowledge about course requirements and assignments and setting goals, however modest, that can be successfully met can help students begin to acquire a sense of mastery over environmental challenges (Glynn & others, 2005).

Learned Helplessness on the Field

In humans, learned helplessness can be produced when negative events are perceived as uncontrollable. Even highly trained athletes can succumb to feelings of learned helplessness in the face of persistent defeats. Athletes who believe that they have no control over the factors that led to their loss or poor performance are less likely to believe that they can succeed in the future (Coffee & others, 2009). They're also less likely to persist in the face of failure (LeFoll & others, 2008).



REUTERS/Dylan Martinez

Since the early demonstrations of learned helplessness in dogs, the notion of learned helplessness has undergone several revisions and refinements (Abramson & others, 1978; Gillham & others, 2001). Learned helplessness has been shown to play a role in psychological disorders, particularly depression, and in the ways that people respond to stressful events. Learned helplessness has also been applied in such diverse fields as management, sales, and health psychology (Wise & Rosqvist, 2006). In Chapter 13, on stress, health, and coping, we will take up the topic of learned helplessness again.

learned helplessness A phenomenon in which exposure to inescapable and uncontrollable aversive events produces passive behavior.

Operant Conditioning and Biological Predispositions

Misbehaving Chickens

Skinner and other behaviorists firmly believed that the general laws of operant conditioning applied to all animal species—whether they were pecking pigeons or bar-pressing rats. As Skinner (1956) wrote:

> Pigeon, rat, monkey, which is which? It doesn't matter. Of course, these species have behavioral repertoires which are as different as their anatomies. But once you have allowed for differences in the ways in which they make contact with the environment, and in the ways in which they act upon the environment, what remains of their behavior shows astonishingly similar properties.

However, psychologists studying operant conditioning, like those studying classical conditioning, found that an animal's natural behavior patterns *could* influence the learning of new behaviors. Consider the experiences of Keller and Marian Breland, two of Skinner's students at the University of Minnesota. The Brelands established a successful business training animals for television commercials, trade shows, fairs, and even displays in department stores (Breland & Breland, 1961). Using operant conditioning, the Brelands trained thousands of animals of many different species to perform all sorts of complex tricks (Bihm & others, 2010; Bihm & others, 2010).

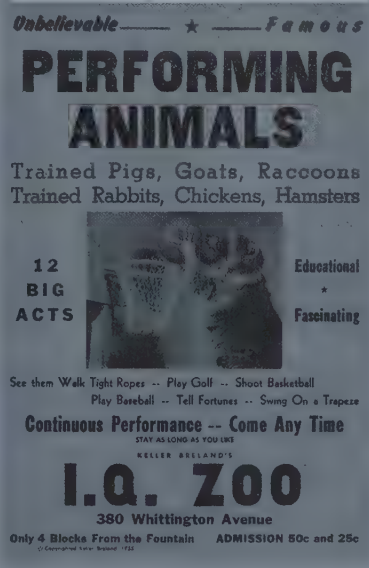
But the Brelands weren't always successful in training the animals. For example, they tried to train a chicken to play baseball. The chicken learned to pull a loop that activated a swinging bat. After hitting the ball, the chicken was supposed to run to first base. The chicken had little trouble learning to pull the loop, but instead of running to first base, the chicken would chase the ball.

The Brelands also tried to train a raccoon to pick up two coins and deposit them into a metal box. The raccoon easily learned to pick up the coins but seemed to resist putting them into the box. Like a furry little miser, it would rub the coins together.

Keller and Marian Breland's "IQ Zoo" B. F. Skinner's former students Keller and Marian Breland moved their animal training business from Minnesota to the warmer climate of Hot Springs, Arkansas, in 1951. By the 1960s, the Brelands'"IQ Zoo" was one of the most popular roadside attractions in the U.S. Among its non-human stars were basketball-playing raccoons, reindeer who operated a printing press, ducks who played the piano, and chickens who danced, walked a tightrope, and played tic-tac-toe. Beyond entertainment, the Brelands were pioneers in the development of animal training and behavior modification techniques. Marian Breland was one of the first psychologists to use positive reinforcement to teach basic self-help skills to people with developmental disabilities and also helped train marine mammals for the U.S. Navy (Bihm & others, 2010; Bihm & others, 2010).



Courtesy of Dr. J. Arthur Gillaspy



Robert E. Bailey

And rather than dropping the coins in the box, it would dip the coins in the box and take them out again. As time went on, this behavior became more persistent, even though the raccoon was not being reinforced for it. In fact, the raccoon's "misbehavior" was actually *preventing* it from getting reinforced for correct behavior (Bailey & Bailey, 1993).

The Brelands noted that such nonreinforced behaviors seemed to reflect innate, instinctive responses. The chicken chasing the ball was behaving like a chicken chasing a bug. Raccoons in the wild instinctively clean and moisten their food by dipping it in streams or rubbing it between their forepaws. These natural behaviors interfered with the operant behaviors the Brelands were attempting to condition—a phenomenon called **instinctive drift** (Bailey & Bailey, 1993).

The biological predisposition to perform such natural behaviors was strong enough to overcome the lack of reinforcement. These instinctual behaviors also *prevented the animals from engaging in the learned behaviors that would result in reinforcement.* Clearly, reinforcement is not the sole determinant of behavior. And, inborn or instinctive behavior patterns can interfere with the operant conditioning of arbitrary responses.

Before you go on to the next section, take a few minutes to review Table 5.5 and make sure you understand the differences between classical and operant conditioning.

TABLE 5.5

Comparing Classical and Operant Conditioning

	Classical Conditioning	Operant Conditioning
Type of behavior	Reflexive, involuntary behaviors	Nonreflexive, voluntary behaviors
Source of behavior	Elicited by stimulus	Emitted by organism
Basis of learning	Associating two stimuli: CS + UCS	Associating a response and the consequence that follows it
Responses conditioned	Physiological and emotional responses	Active behaviors that operate on the environment
Extinction process	Conditioned response decreases when conditioned stimulus is repeatedly presented alone	Responding decreases with elimination of reinforcing consequences
Cognitive aspects	Expectation that CS reliably predicts the UCS	Performance of behavior influenced by the expectation of reinforcement or punishment
Evolutionary influences	Innate predispositions influence how easily an association is formed between a particular stimulus and response	Behaviors similar to natural or instinctive behaviors are more readily conditioned



Observational Learning

Imitating the Actions of Others

KEY THEME

› In observational learning, we learn through watching and imitating the behaviors of others.

KEY QUESTIONS

› How did Albert Bandura demonstrate the principles of observational learning?

› What four mental processes are involved in observational learning?

› How has observational learning been shown in nonhuman animals?

instinctive drift The tendency of an animal to revert to instinctive behaviors that can interfere with the performance of an operantly conditioned response.

observational learning Learning that occurs through observing the actions of others.

Classical conditioning and operant conditioning emphasize the role of direct experiences in learning, such as directly experiencing a reinforcing or punishing stimulus following a particular behavior. But much human learning occurs *indirectly,* by watching what others do, then imitating it. In **observational learning**, learning takes place through observing the actions of others.

Humans develop the capacity to learn through observation at a very early age. Studies of infants, some as young as 2–3 days, have shown that they will imitate a variety of actions, including opening their mouths, sticking out their tongues, and making other facial expressions (Leighton & Heyes, 2010). In fact, even newborn infants can imitate adult expressions when they are less than an hour old (Meltzoff & Moore, 1989; Meltzoff, 2007). Toddlers and preschoolers can use observational learning to figure out how to solve complex problems like extracting a toy from a puzzle box (Flynn & Whiten, 2010). Clearly, the human brain is wired for imitation. The Focus on Neuroscience on the next page describes new research that may shed some light on the brain mechanisms that support our ability to learn through observation.

Albert Bandura is the psychologist most strongly identified with observational learning. Bandura (1974) believes that observational learning is the result of cognitive processes that are "actively judgmental and constructive," not merely "mechanical copying." To illustrate his theory, let's consider his famous experiment involving the imitation of aggressive behaviors (Bandura, 1965). In the experiment, four-year-old children separately watched a short film showing an adult playing aggressively with a Bobo doll—a large, inflated balloon doll that stands upright because the bottom is weighted with sand. All the children saw the adult hit, kick, and punch the Bobo doll in the film.

However, there were three different versions of the film, each with a different ending. Some children saw the adult *reinforced* with soft drinks, candy, and snacks after performing the aggressive actions. Other children saw a version in which the aggressive adult was *punished* for the actions with a scolding and a spanking by another adult. Finally, some children watched a version of the film in which the aggressive adult experienced *no consequences.*

After seeing the film, each child was allowed to play alone in a room with several toys, including a Bobo doll. The playroom was equipped with a one-way window so that the child's behavior could be observed. Bandura found that the consequences the children observed in the film made a difference. Children who watched the film in which the adult was punished were much less likely to imitate the aggressive behaviors than were children who watched either of the other two film endings.

Then Bandura added an interesting twist to the experiment. Each child was asked to show the experimenter what the adult did in the film. For every behavior they could imitate, the child was rewarded with snacks and stickers. Virtually all the children imitated the adult's behaviors they had observed in the film, including the aggressive behaviors. The particular version of the film the children had seen made no difference.

Bandura (1965) explained these results much as Tolman explained latent learning. Reinforcement is *not* essential for learning to occur. Rather, the *expectation of reinforcement* affects the *performance* of what has been learned.



Courtesy of Albert Bandura

Albert Bandura (b. 1925) Bandura contends that most human behavior is acquired through observational learning rather than through trial and error or direct experience of the consequences of our actions. Watching and processing information about the actions of others, including the consequences that occur, influence the likelihood that the behavior will be imitated.

The Classic Bobo Doll Experiment
Bandura demonstrated the powerful influence of observational learning in a series of experiments conducted in the early 1960s. Children watched a film showing an adult playing aggressively with an inflated Bobo doll. If they saw the adult rewarded with candy for the aggressive behavior or experience no consequences, the children were much more likely to imitate the behavior than if they saw the adult punished for the aggressive behavior (Bandura, 1965; Bandura & others, 1963).



Courtesy Albert Bandura, Stanford University

FOCUS ON NEUROSCIENCE

Mirror Neurons: Imitation in the Brain?

Psychologists have only recently begun to understand the neural underpinnings of the human ability to imitate behavior. The first clue emerged from an accidental discovery in a lab in Palermo, Italy, in the mid-1990s. Neuroscientist Giacomo Rizzolatti and his colleagues were studying neurons in the premotor cortex of macaque monkeys. Using tiny electrodes to record the activity of individual neurons, Rizzolatti's team had painstakingly identified the specific motor neurons involved in simple behaviors, such as picking up a peanut or grabbing a toy (see Rizzolatti & Sinigaglia, 2008).

Then Rizzolatti noticed something odd. As one of the wired-up monkeys watched a lab assistant pick up a peanut, a neuron fired in the monkey's brain—the *same* neuron that fired when the monkey itself picked up a peanut. At first, the researchers thought that the monkey must be making tiny muscle movements, and that these movements were responsible for the motor neuron activity. But the monkey was sitting perfectly still. The researchers were baffled because a motor neuron was thought to fire only if a motor behavior was occurring.

The explanation? Rizzolatti's team had discovered a new class of specialized neurons, which they dubbed ***mirror neurons.*** Mirror neurons are neurons that fire both when an action is performed and when the action is simply perceived (Iacoboni, 2009). In effect, these neurons imitate or "mirror" the observed action as though the observer were actually carrying out the action.

It's important to note that mirror neurons are *not* a new physical type of neurons. A mirror neuron is defined by its *function*, rather than its physical structure.

Do mirror neurons simply reflect visual stimuli, or are they somehow involved in providing a mental representation of an action? Rizzolatti's team conducted a series of experiments to find out (see Rizzolatti & Sinigaglia, 2008; Rizzolatti & others, 2006). First, Evelyne Kohler and her colleagues (2002) showed that the same neurons that activated when a monkey cracked open a peanut shell also activated when a monkey simply *heard* a peanut shell breaking.

Another study extended the idea that mirror neurons are involved in the mental representation of an action. M. Alessandra Umiltà and her colleagues (2001) identified the motor mirror neurons that fired when a monkey saw the researcher's hand reaching for and grasping food. Then a screen was placed in front of the food. Now the monkey could see the researcher's hand moving toward the screen but could *not* actually see the hand touching the food. Would the motor mirror neurons fire if the monkey could only imagine the action of grasping the food? Yes. Even when the action was hidden from view and could only be inferred, the mirror neurons associated with that action fired.

Following their discovery in the motor cortex, mirror neurons have since been identified in many other brain regions (see Iacoboni, 2009). Today, many psychologists use the term *mirror neuron system* to describe mirroring in the brain. That's because even simple behaviors and sensations often involve groups of mirror neurons firing together rather than single neurons firing separately (Cattaneo & Rizzolatti, 2009).

Evidence of Human Mirror Neurons

Brain-imaging studies like the one illustrated at right have provided *indirect* evidence of mirror neurons in the human brain (see Oberman & Ramachandran, 2007; Slack, 2007). New studies have provided the first direct evidence for the existence of mirror neurons in humans (Iacoboni, 2009; Mukamel & others, 2010). Electrodes were temporarily implanted in the brains of epileptic patients as part of their preparation for surgery. The activity of individual neurons was recorded while the patients performed simple actions, such as grasping a cup and making facial expressions. Then the researchers recorded neuron activity while the patients simply viewed short video clips and photographs of others executing the same actions. The results? One study identified 11 and another study identified 34 neurons activated by *both* the performance and observation of a behavior. This represents the first direct evidence of individual mirror neurons in the human brain (Keysers & Gazzola, 2010).

Some neuroscientists and psychologists believe that mirror neurons play an important role in imitation and observational learning (Cattaneo & Rizzolatti, 2009). Some scientists think that dysfunctions in the mirror system may be involved in autism and other disorders that are associated with impaired social functioning (Perkins & others, 2010). Although such speculations are intriguing, more scientific evidence is needed before such conclusions can be drawn (Decety, 2010; Fan & others, 2010).



Lahav, Amir; Saltzman, Elliot; & Schlaug, Gottfried. (2007, January 10). Action representation of sound: Audiomotor recognition network while listening to newly acquired actions. *Journal of Neuroscience*, 27, No. 2, 308–314. Figure 3.

Musical Mirror Neurons Non-musicians were trained to play a piece of music by ear on a piano keyboard, then underwent a series of fMRI scans (Lahav & others, 2007). Panel (a) shows the participants' brain activity as they listened to the same music they had already learned to play. Even though they were not moving as they laid in the scanner, motor areas of the brain were activated (dark red). The brighter red/yellow color indicates activation in the brain's auditory areas. Panel (b) shows participants' brain activity while they listened to unfamiliar music utilizing the same musical notes but in a different sequence.

As you compare the scans in (a) and (b), notice the extensive activation in motor-related brain regions when the participants listened to the music that they had already learned to play (a). However, these motor areas were *not* activated when they listened to the unfamiliar music that they had never played (b).

Bandura (1986) suggests that four cognitive processes interact to determine whether imitation will occur. First, you must pay *attention* to the other person's behavior. Second, you must *remember* the other person's behavior so that you can perform it at a later time. That is, you must form and store a mental representation of the behavior to be imitated. Third, you must be able to transform this mental representation into *actions that you are capable of reproducing*. These three factors—attention, memory, and motor skills—are necessary for learning to take place through observation.

Fourth, there must be some *motivation* for you to imitate the behavior. This factor is crucial to the actual performance of the learned behavior. You are more likely to imitate a behavior if there is some expectation that doing so will produce reinforcement or reward. Thus, all the children were capable of imitating the adult's aggressive behavior. But the children who saw the aggressive adult being rewarded were much more likely to imitate the aggressive behavior than were the children who saw the adult punished. Table 5.6 summarizes other factors that increase the likelihood of imitation.

TABLE 5.6

Factors That Increase Imitation

You're more likely to imitate:

- People who are rewarded for their behavior
- Warm, nurturing people
- People who have control over you or have the power to influence your life
- People who are similar to you in terms of age, sex, and interests
- People you perceive as having higher social status
- When the task to be imitated is not extremely easy or difficult
- If you lack confidence in your own abilities in a particular situation
- If the situation is unfamiliar or ambiguous
- If you've been rewarded for imitating the same behavior in the past

Source: Based on research summarized in Bandura (1977, 1986, 1997).

Observational Learning in Animals

Many nonhuman animals have been shown to learn new behaviors through observation and imitation (Reader & Biro, 2010). One study involved German shepherd puppies whose mothers were specially trained to locate and retrieve hidden drugs (Slabbert & Rasa, 1997). Puppies who had observed their mothers locate and retrieve the packets of narcotics were significantly better at performing the same task three months later than were puppies who had not seen adult dogs perform this behavior.

The ability to learn a novel behavior through observation has been demonstrated in many different species of animals, ranging from golden hamsters (Lupfer & others, 2003), to starlings (Boogert & others, 2008), Caledonian crows (Holzhaider & others, 2010), and ring-tailed lemurs (Kendal & others, 2010). Even guppies can learn foraging behavior and escape routes from other guppies (Reader & others, 2003). Along with learning new behaviors, animals learn to modify existing behaviors by observing others of their species. For example, rats that observed the eating preferences of other rats mimicked the food choices of the rats from their social group (Galef & Whiskin, 2008).

Chimpanzees, apes, and other primates are quite adept at learning through observation, sometimes in sophisticated ways (Dindo & others, 2010). For example, macaque monkeys are capable of learning a cognitive rule for ordering lists of photographs simply from watching another macaque successfully complete the task (Subiaul & others, 2004).

■ **mirror neurons** A type of neuron that activates both when an action is performed and when the same action is perceived.



Lewis J. Houghton/ www.lewspics.com

Chimpanzee Culture: Observational Learning in the Wild Chimpanzee tribes in the wild develop their own unique "cultures" or behavioral differences in tool use, foraging skills, and even courtship rituals (Hopper & others, 2007). Apparently, these distinct behavior patterns are acquired and transmitted through observational learning (Whiten, 2009). For example, after an individual chimp learned a new food-gathering technique, the rest of its group acquired the new skill within a few days. In turn, the newly acquired skill spread to other chimpanzee groups who could observe the new behavior (Whiten & others, 2007). These chimps in the Edinburgh Zoo are learning how to use a tool to extract food—one of the tasks that Andrew Whiten (2009) has used to study observational learning and the development of unique behavioral traditions among chimpanzee tribes.

Just as with humans, motivational factors seem to play a role in observational learning by primates. One study involved imitative behavior of free-ranging orangutans in a preserve located in central Indonesia (Russon & Galdikas, 1995). The orangutans imitated the behavior of both humans and other orangutans, but they were more likely to imitate high-status or dominant models than low-status models. The orangutans were also more likely to imitate models with whom they had close relationships, such as biological parents, siblings, or their human caregivers. Human strangers were virtually never imitated.

Applications of Observational Learning

Bandura's finding that children will imitate film footage of aggressive behavior has more than just theoretical importance. One obvious implication has to do with the effects of negative behaviors that are depicted in films and television shows. Is there any evidence that television and other media can increase negative or destructive behaviors in viewers?

One recent study conducted by psychologist Rebecca Collins and her colleagues (2004) examined the impact of television portrayals of sexual activity on the behavior of U.S. adolescents between the ages of 12 and 17. Over the two-year period of the study, researchers found that adolescents who watched large amounts of television containing sexual content were twice as likely to begin engaging in sexual intercourse in the following year as adolescents who were the same age but watched the least amount of sexually oriented programming.

Are we talking about X-rated cable programs or sexually suggestive music videos? No. Among the programs that the researchers rated as high in sexual content were such popular network programs as *Friends* and *That '70s Show.* In fact, researchers found that exposure to TV shows that simply *talked* about sex was associated with the same risks as exposure to TV that depicted sexual behavior. Although other factors contributed to the likelihood that adolescents would become sexually active, the impact of TV programming was substantial. "The 12-year-olds who watched a lot of television with sexual content behaved like the 14- or 15-year-olds who watched the least amount of sexual television," Collins (2004) pointed out.

What about exposure to more explicit sexual content, such as pornographic or sexually explicit Web sites on the Internet? One study found that adolescents who visited such sites were more likely to have multiple sexual partners and to have used alcohol or drugs during their most recent sexual experience (Braun-Courville & Rojas, 2009).

Another important implication of Bandura's research relates to the effects of media depictions of violence on behavior. In the Critical Thinking box, we take an in-depth look at the relationship between media portrayals of violence and aggressive behavior.

Given the potential impact of negative media images, let's look at the flip side. Is there any evidence that television and other media can encourage socially desirable behavior?

A remarkably effective application of observational learning has been the use of television and radio dramas to promote social change and healthy behaviors in Asia, Latin America, and Africa (Population Communications International, 2004). Pioneered by Mexican television executive Miguel Sabido, the first such attempt was a long-running serial drama that used observational learning principles to promote literacy among adults. The main storyline centered on the experiences of a group of people in a literacy self-instruction group. Millions of viewers faithfully watched the series. In the year before the televised series, about 90,000 people were enrolled in such literacy groups. In the year during the series, enrollment jumped to 840,000 people (Bandura, 1997).

Television and Teen Pregnancy?
Shown here is a still from the hit TV series *Gossip Girl.* Anita Chandra and her colleagues (2008) found that teen pregnancies were positively correlated with exposure to sexual content on television. Compared to teens who watched low levels of sexual content on television, teenagers who watched high levels were twice as likely to get pregnant or get a partner pregnant. Mainstream television shows such as *Sex and the City, That '70s Show,* and *Friends* were classified as having high sexual content. According to Chandra and her colleagues, the findings of their correlational study suggest that such television shows emphasize only the positive aspects of sexual behavior—while ignoring the risks.



THE CW/courtesy Everett Collection

CRITICAL THINKING

Does Exposure to Media Violence *Cause* Aggressive Behavior?

Bandura's early observational learning studies showed preschoolers enthusiastically mimicking the movie actions of an adult pummeling a Bobo doll. His research provided a powerful paradigm to study the effects of "entertainment" violence. Bandura found that observed actions were most likely to be imitated when:

- They were performed by a model who is attractive and who has high status or is a dominant member of the viewer's social group.
- The model is rewarded for his or her behavior.
- The model is not punished for his or her actions.

Over the past four decades, more than 1,000 studies have investigated the relationship between media depictions of violence and increases in aggressive behavior in the real world (see Bushman & Anderson, 2007). We'll highlight some key findings here.

How Prevalent Is Violence on Television in the United States?

An alarming amount of violence is depicted on television in the United States. On average, American youth witness 1,000 rapes, murders, and assaults on television annually (Parents Television Council, 2007). Violent behavior is portrayed in almost two-thirds of all television programs, and one-third of programs depict nine or more acts of violence (Smith & others, 2002). Evidence also suggests that the amount of violence shown on American television has increased over past decades (Hetsroni, 2007; Signorelli, 2005).

More troubling, much of the violent behavior is depicted in ways that are known to *increase* the likelihood of imitation. For example, violent behavior is not punished and is often perpetrated by the heroes or other "good guys." And, most programs do *not* show the long-term consequences of violence.

Is Exposure to Media Violence Linked to Aggressive Behavior?

Numerous research studies show that exposure to media violence produces short-term increases in laboratory measures of aggressive thoughts and behavior. And, hundreds of correlational studies demonstrate a link between exposure to violent media and aggressive behavior both in and out of the classroom (see Bushman & Anderson, 2007; Huesmann & Taylor, 2006; Murray, 2008).

Reviewing the accumulation of decades of research evidence, the American Academy of Pediatrics issued a statement that echoed previous policy statements by other public health organizations, including the American Psychological Association and the American Medical Association. The conclusion: "Extensive research evidence indicates that media violence can contribute to aggressive behavior, desensitization to violence, nightmares, and fear of being harmed" (AAP Council on Communications Media, 2009). According to the U.S. Surgeon General, exposure to violent media is as important a risk factor for violence as poverty, substance abuse, and poor parenting (Bushman & others, 2009).

But Does Media Violence *Cause* Aggressive or Violent Behavior?

Brad Bushman and his colleagues (2009) reviewed five decades of research on the effects of media violence. The 300 studies included laboratory and field experiments, and cross-sectional and longitudinal studies involving over 50,000 participants. Their conclusion: "Exposure to violent media increases aggression and violence."



Robert Voets/CBS via Getty Images

Media Violence Violence is a common theme in film and television. Does viewing aggressive behavior make people more likely to commit violent acts themselves?

However, many psychologists are more cautious in their conclusions about the effects of media violence (Ferguson & others, 2009). One important point is that violent behavior is a complex phenomenon that is unlikely to have a single cause.

It's also important to note that the vast majority of studies on media violence and aggressive behavior are *correlational* (Ferguson & Kilbourn, 2009; Savage & Yancey, 2008). As you learned in Chapter 1, correlation does not necessarily imply causation. Even if two factors are strongly correlated, some other variable could be responsible for the association between the two factors. Experimental studies, on the other hand, *are* designed to demonstrate causality. However, most experimental studies involve artificial measures of aggressive behavior, which may *not* accurately measure the likelihood that a participant will act aggressively in real life.

Psychologists generally agree that some viewers *are* highly susceptible to the negative effects of media violence (see Grimes & others, 2008). Some researchers think that the time has come to go beyond the question of *whether* media violence causes aggressive behavior and focus instead on investigating the factors that are most likely to be associated with its harmful effects (Feshbach & Tangney, 2008).

CRITICAL THINKING QUESTIONS

- Given the evidence summarized here, what conclusions can you draw about the effect of violent media images on aggressive behavior?
- Why is it so difficult to design an experimental study that would conclusively demonstrate that violent media *causes* aggressive behavior?
- Given the general conclusion that some, but not all, viewers are likely to become more aggressive after viewing violent media, what should be done about media violence?



"Ordinary People" Population Communications International is a nonprofit group that develops television and radio dramatic series that are based on the principles of observational learning. This scene is from the Chinese television series *Bai Xing*, which means "Ordinary People." Set in a small village on the banks of the Yellow River in China, this award-winning dramatic series centers on the experiences of Lüye, a young woman who struggles against the rigidity of traditional beliefs and customs. Among the series' goals are to show the importance of economic independence for women and the need to overcome the traditional Chinese preference for sons over daughters. In this scene, Lüye is distraught over her impending marriage to a man she does not love, and is being comforted by her mother.

Courtesy of Population Communications International/ Wencai Audio Video

Since the success of this program, the nonprofit group Population Communications International (2004) has developed over 240 "entertainment-education programs" in 27 different countries. These popular programs are based on Bandura's observational learning paradigm. Each series is developed with the input of local advisers and is written, produced, and performed by creative talent in the country of the intended audience. These serial dramas motivate individuals to adopt new attitudes and behavior by modeling behaviors that promote family health, stable communities, and a sustainable environment. Among the most popular radio and television serial dramas:

- Culturally sensitive programs encouraging family planning and reproductive health in India, Brazil, and Tanzania
- Radio serials aimed at preventing the transmission of HIV/AIDS in Kenya and Peru
- An award-winning dramatic series set in a rural Chinese village, starring a young female protagonist, that emphasized the value of female children and economic independence for women

These long-running programs feature characters with whom the average viewer can easily identify. While the storylines are dramatic, they also reflect everyday challenges. As Bandura (2002) notes, "Seeing people similar to themselves change their lives for the better not only conveys strategies for how to do it but raises viewers' sense of efficacy that they too can succeed. Viewers come to admire and are inspired by characters in their likenesses who struggle with difficult obstacles and eventually overcome them."

Education-entertainment programs are designed to fulfill the optimal conditions for observational learning to occur (Bandura, 2002). The dramatic intensity, highly involving plot lines, and engaging characters ensure that viewers will become involved in the dramas and pay *attention*. To ensure that the modeled messages are *remembered,* an epilogue at the conclusion of each episode summarizes the key points and issues of the episode. To enhance the viewers' *ability* to carry out the modeled behaviors, a variety of support programs and groups are put in place when the series airs. And *motivating* people to change their behaviors in line with the modeled behaviors is accomplished by depicting the benefits of doing so. Research studies have confirmed the highly successful impact of these extremely popular dramas (see Singhal & others, 2004; Gesser-Edelsburg & others, 2010).

The serials dramatize the everyday problems people struggle with and model functional strategies and solutions to them. This approach succeeds because it informs, enables, motivates, and guides people for personal and social changes that improve their lives.

—*Albert Bandura (2004a)*

Entertainment-education programs have also aired in the U.S. For example, the radio program *Entrelazado,* which is Spanish for "Entwined," was developed in Birmingham, Alabama, to encourage healthy behaviors, including prevention of obesity and tobacco use, among the local Hispanic population (Media for Health, 2011).

Beyond the effects of media depictions on behavior, observational learning has been applied in a wide variety of settings. The fields of education, vocational and job training, psychotherapy, counseling, and medicine use observational learning to help teach appropriate behaviors.

CONCEPT REVIEW 5.4

Learning Researchers and Processes

For each of the situations described, name the process involved (classical conditioning, operant conditioning, latent learning, instinctive drift, observational learning) and the psychologist(s) associated with it.

1. Lisa transfers to a new college and spends her first few days on campus getting oriented. A week later she decides to have lunch at the college cafeteria. Although she has never eaten there before, she has no problem finding it.

   Process _____ Psychologist(s) _____

2. Little Ben rarely brushed his teeth. Ben's parents began giving him a sticker every time he brushed his teeth. Now, Ben brushes his teeth frequently.

   Process _____ Psychologist(s) _____

3. When Brittany's grandmother gave her a toy broom, the two-year-old immediately tried to sweep the floor with it.

   Process _____ Psychologist(s) _____

4. One of Jordan's first jobs as an animal trainer was to train a pig to pick up a coin and deposit it into a piggy bank. Through shaping and reinforcement with food, Jordan had some initial success, but soon the pig was more interested in pushing the coin along the ground with its snout than in putting it in the bank.

   Process _____ Psychologist(s) _____

5. Jan's ex-husband always wore Old Spice aftershave. Five years after her divorce, Jan still cringes whenever she encounters someone who smells like Old Spice.

   Process _____ Psychologist(s) _____



CLOSING THOUGHTS

One theme throughout this chapter has been the quest to discover general laws of learning that would apply across virtually all species and situations. Watson was convinced that these laws were contained in the principles of classical conditioning. Skinner contended that they were to be found in the principles of operant conditioning. In a sense, they were both right. Thousands of experiments have shown that behavior can be reliably and predictably influenced by classical and operant conditioning procedures. By and large, the general principles of classical and operant conditioning hold up quite well across a wide range of species and situations.

But you've also seen that the general principles of classical and operant conditioning are just that—general, not absolute. Such researchers as John Garcia and Marian and Keller Breland recognized the importance of a species' evolutionary and biological heritage in acquiring new behaviors. Other researchers, such as Edward Tolman and Robert Rescorla, drew attention to the important role played by cognitive processes in learning. And Albert Bandura's investigations of observational learning underscored that classical and operant conditioning principles could not account for all learning.

Another prominent theme has been the adaptive nature of learning. Faced with an ever-changing environment, an organism's capacity to learn is critical to adaptation and survival. Clearly, there are survival advantages in being able to learn that a neutral stimulus can signal an important upcoming event, as in classical conditioning. An organism also enhances its odds of survival by being responsive to the consequences of its actions, as in operant conditioning. And, by observing the actions and consequences experienced by others, behaviors can be acquired through imitation. Thus, it is probably because these abilities are so useful in so many environments that the basic principles of learning are demonstrated with such consistency across so many species.

In the final analysis, it's probably safe to say that the most important consequence of learning is that it promotes the adaptation of many species, including humans, to their unique environments. Were it not for the adaptive nature of learning, Erv would probably have gotten trapped in the attic again!

ENHANCING WELL-BEING WITH PSYCHOLOGY

Using Learning Principles to Improve Your Self-Control

Self-control often involves choosing between two reinforcers: (1) a *long-term reinforcer* that will provide gratification at some point in the future or (2) a *short-term reinforcer* that provides immediate gratification but gets in the way of obtaining a long-term reinforcer. Objectively, the benefits of the long-term reinforcer typically far outweigh the benefits associated with the short-term, immediate reinforcer. Yet despite our commitment to the long-term goal, sometimes we choose a short-term reinforcer that conflicts with it. Why?

The Shifting Value of Reinforcers

The key is that *the relative value of reinforcers can shift over time* (Ainslie, 1975, 1992; Rachlin, 1974, 2000). Let's use an example to illustrate this principle. Suppose you sign up for an 8:00 A.M. class that meets every Tuesday morning. On Monday night, the short-term reinforcer (getting extra sleep on Tuesday morning) and the long-term reinforcer (getting a good course grade at the end of the semester) are both potential future reinforcers. Neither reinforcer is immediately available. So, when you compare these two future reinforcers, the value of making a good grade easily outweighs the value of getting extra sleep on Tuesday morning. That's why you duly set the alarm clock for 6:00 A.M. so you will get to class on time.

However, as the availability of a reinforcer gets closer, the subjective value of the reinforcer increases. Consequently, when your alarm goes off on Tuesday morning, the situation is fundamentally different. The short-term reinforcer is now immediately available: staying in that warm, comfy bed. Compared with Monday night when you set the alarm, the subjective value of extra sleep has increased significantly. Although making a good grade in the course is still important to you, its subjective value has not increased on Tuesday morning. After all, that long-term reinforcer is still in the distant future.

At the moment you make your decision, you choose whichever reinforcer has the greater apparent value to you. At that moment, if the subjective value of the short-term reinforcer outweighs that of the long-term reinforcer, you're very likely to choose the short-term reinforcer (Fishbach & others, 2010). In other words, you'll probably stay in bed.

When you understand how the subjective values of reinforcers shift over time, the tendency to impulsively cave in to available short-term reinforcers starts to make more sense. The availability of an immediate, short-term reinforcer can temporarily outweigh the subjective value of a long-term reinforcer in the distant future (Steel, 2007). How can you counteract these momentary surges in the subjective value of short-term reinforcers? Fortunately, there are several strategies that can help you overcome the temptation of short-term reinforcers and improve your self-control (Fishbach & others, 2010; Kruglanski & others, 2010).

Strategy 1: Precommitment

Precommitment involves making an advance commitment to your long-term goal, one that will be difficult to change when a conflicting reinforcer becomes available (Fujita & Roberts, 2010). In the case of getting to class on time, a precommitment could involve setting multiple alarms and putting them far enough away that you will be forced to get out of bed to shut each of them off. Or you could ask an early-rising friend to call you on the phone and make sure you're awake.



Bizarro (new) ©Dan Piraro. King Features Syndicate

Strategy 2: Self-Reinforcement

Sometimes long-term goals seem so far away that your sense of potential future reinforcement seems weak compared with immediate reinforcers. One strategy to increase the subjective value of the long-term reinforcer is to use self-reinforcement for current behaviors related to your long-term goal (Fishbach & others, 2010). For example, promise yourself that if you spend two hours studying in the library, you'll reward yourself by watching a movie.

It's important, however, to reward yourself only *after* you perform the desired behavior. If you say to yourself, "Rather than study tonight, I'll go to this party and make up for it by studying tomorrow," you've blown it. You've just reinforced yourself for *not* studying! This would be akin to trying to increase bar-pressing behavior in a rat by giving the rat a pellet of food *before* it pressed the bar. Obviously, this contradicts the basic principle of positive reinforcement in which behavior is *followed* by the reinforcing stimulus.

Strategy 3: Stimulus Control

Remember, environmental stimuli can act as discriminative stimuli that "set the occasion" for a particular response (Kruglanski & others, 2010). In effect, the environmental cues that precede a behavior can acquire some control over future occurrences of that behavior. So be aware of the environmental cues that are likely to trigger unwanted behaviors, such as studying in the kitchen (a cue for eating) or in an easy chair in the living room (a cue for watching television). Then replace those cues with others that will help you achieve your long-term goals.

For example, always study in a specific location, whether it's the library, in an empty classroom, or at a table or desk in a certain corner of your apartment. Over time, these environmental cues will become associated with the behavior of studying.

Strategy 4: Focus on the Delayed Reinforcer

The cognitive aspects of learning also play a role in choosing behaviors associated with long-term reinforcers (Mischel & others, 2004; Mischel, 1996). When faced with a choice between an immediate and a delayed reinforcer, focus your attention on the delayed reinforcer. You'll be less likely to impulsively choose the short-term reinforcer (Kruglanski & others, 2010).

Practically speaking, this means that if your goal is to save money for school, don't fantasize about a new car or expensive shoes. Focus instead

on the delayed reinforcement of achieving your long-term goal (Kross & others, 2010). Imagine yourself proudly walking across the stage and receiving your college degree. Visualize yourself fulfilling your long-term career goals. The idea in selectively focusing on the delayed reinforcer is to mentally bridge the gap between the present and the ultimate attainment of your future goal. One of our students, a biology major, put a picture of a famous woman biologist next to her desk to help inspire her to study.

Strategy 5: Observe Good Role Models

Observational learning is another strategy you can use to improve self-control (Maddux & others, 2010). In a series of classic studies, psychologist Walter Mischel found that children who observed others choose a delayed reinforcer over an immediate reinforcer were more likely to choose the delayed reinforcer themselves (Mischel, 1966; Kross & others, 2010). So look for good role models. Observing others who are currently behaving in ways that will ultimately help them realize their long-term goals can make it easier for you to do the same.

CHAPTER REVIEW

Learning

KEY POINTS

Introduction: What Is Learning?

- **Learning** is defined as a relatively enduring change in behavior or knowledge that is due to past experience. Learning often reflects adaptation to the environment. **Conditioning** is the process of learning associations between environmental events and behavioral responses. Classical conditioning, operant conditioning, and observational learning are three types of learning.

Classical Conditioning: Associating Stimuli

- Ivan Pavlov, a Russian physiologist, discovered the principles of classical conditioning while studying the digestive system of dogs.
- **Classical conditioning** deals with reflexive behaviors that are elicited by a stimulus and results from learning an association between two stimuli. A neutral stimulus is repeatedly paired with an unlearned, natural stimulus (the **unconditioned stimulus,** or **UCS**), producing a reflexive response (the **unconditioned response,** or **UCR**). Eventually, the neutral stimulus (now called a **conditioned stimulus,** or **CS**) elicits the same reflexive response (the **conditioned response,** or **CR**) that was initially elicited by the natural stimulus.
- Factors that affect the strength of the conditioned response include the frequency with which the conditioned and unconditioned stimuli are paired, and the timing of the stimulus presentations.
- In **stimulus generalization,** a new stimulus that is similar to the conditioned stimulus produces the conditioned response. In **stimulus discrimination,** one stimulus elicits the conditioned response but another, similar stimulus does not.
- **Higher order conditioning** occurs when a conditioned stimulus functions as an unconditioned stimulus in a new conditioning trial.
- In classical conditioning, **extinction** occurs when the conditioned stimulus no longer elicits the conditioned response. However, extinction is not unlearning. **Spontaneous recovery** of the conditioned response may occur.
- John B. Watson defined psychology as the scientific study of behavior and founded **behaviorism.** According to Watson, all human behavior is a result of conditioning and learning.
- As Watson demonstrated in his famous Little Albert study, emotional responses can be classically conditioned.
- Classical conditioning can also contribute to the **placebo response** and other drug effects.

Contemporary Views of Classical Conditioning

- Modern learning researchers acknowledge that mental processes and natural behavior patterns influence the learning process. Robert Rescorla demonstrated that classical conditioning involves learning the relations between events and assessing the reliability of signals.
- John Garcia's research showed that **taste aversions** violate key principles of classical conditioning, which is affected by **biological preparedness.** For a given species, some stimuli are more readily associated than others.

Operant Conditioning: Associating Behaviors and Consequences

- Edward Thorndike investigated the learning of active behaviors and formulated the **law of effect.** B. F. Skinner's operant conditioning principles explain how **operants,** or new, voluntary behaviors, are acquired.
- **Operant conditioning** explains learning as a process in which behavior is shaped and modified by its consequences. **Reinforcement** increases the likelihood of an operant's being repeated. In **positive reinforcement,** a response is strengthened because a reinforcing stimulus is added or presented. In **negative reinforcement,** a response is strengthened because an aversive stimulus is subtracted or removed. Reinforcers may be **primary reinforcers** or **conditioned reinforcers.**
- **Punishment** decreases the likelihood of an operant's being repeated. Two forms of punishment are **punishment by application** and **punishment by removal.** Aversive consequences do not always function as effective punishments. As a method of controlling behavior, punishment has many drawbacks.
- The **discriminative stimulus** is the stimulus in the presence of which a particular operant is likely to be reinforced; it sets the occasion for a particular response.

- New behaviors can be acquired through the process of **shaping.** An **operant chamber,** or **Skinner box,** is often used to study the acquisition of new behaviors by laboratory animals. Shaping is frequently used in everyday life to teach new behaviors.
- Once acquired, behaviors are maintained through **continuous reinforcement** or **partial reinforcement.** Behaviors on a partial reinforcement schedule are more resistant to **extinction** than are behaviors on a continuous reinforcement schedule. This phenomenon is known as the **partial reinforcement effect. Schedules of reinforcement** include the **fixed-ratio (FR), variable-ratio (VR), fixed-interval (FI),** and **variable-interval (VI) schedules.**
- In **behavior modification,** the principles of operant conditioning are applied to help people develop more adaptive behaviors.

Contemporary Views of Operant Conditioning

- Modern learning researchers acknowledge that operant conditioning involves cognitive processes and is influenced by natural behavior patterns. Edward Tolman's research on **cognitive maps** and **latent learning** demonstrated the involvement of cognitive processes in learning active behaviors. **Learned helplessness** may result when a person or an animal develops the cognitive expectation that aversive stimuli are unavoidable or uncontrollable.
- The phenomenon of **instinctive drift** refers to the fact that an animal's natural behavior patterns can affect operant conditioning by influencing what it is capable of learning.

Observational Learning: Imitating the Actions of Others

- Albert Bandura systematically investigated how new behaviors could be acquired through **observational learning.** Observational learning involves the cognitive processes of attention, memory, motor skills, and motivation.

KEY TERMS

learning, p. 184
conditioning, p. 184
classical conditioning, p. 186
unconditioned stimulus (UCS), p. 186
unconditioned response (UCR), p. 186
conditioned stimulus (CS), p. 186
conditioned response (CR), p. 186
stimulus generalization, p. 188
stimulus discrimination, p. 188
higher order conditioning, p. 188
extinction (in classical conditioning), p. 189
spontaneous recovery, p. 189
behaviorism, p. 190
placebo response, p. 194
taste aversion, p. 197
biological preparedness, p. 198
law of effect, p. 200
operant, p. 201
operant conditioning, p. 201
reinforcement, p. 201
positive reinforcement, p. 202
negative reinforcement, p. 202
primary reinforcer, p. 203
conditioned reinforcer, p. 203
punishment, p. 204
punishment by application, p. 204
punishment by removal, p. 205
discriminative stimulus, p. 207
operant chamber (Skinner box), p. 209
shaping, p. 209
continuous reinforcement, p. 210
partial reinforcement, p. 210
extinction (in operant conditioning), p. 210
partial reinforcement effect, p. 210
schedule of reinforcement, p. 211
fixed-ratio (FR) schedule, p. 211
variable-ratio (VR) schedule, p. 211
fixed-interval (FI) schedule, p. 211
variable-interval (VI) schedule, p. 211
behavior modification, p. 212
cognitive map, p. 214
latent learning, p. 214
learned helplessness, p. 216
instinctive drift, p. 218
observational learning, p. 218
mirror neurons, p. 220

KEY PEOPLE

Albert Bandura (b. 1925) American psychologist who experimentally investigated observational learning, emphasizing the role of cognitive factors. (p. 219)

John Garcia (b. 1917) American psychologist who experimentally demonstrated the learning of taste aversions in animals, a finding that challenged several basic assumptions of classical conditioning. (p. 197)

Ivan Pavlov (1849–1936) Russian physiologist who first described the basic learning process of associating stimuli that is now called classical conditioning. (p. 185)

Robert A. Rescorla (b. 1940) American psychologist who experimentally demonstrated the involvement of cognitive processes in classical conditioning. (p. 195)

Martin Seligman (b. 1942) American psychologist who is best known for his theory of learned helplessness and for founding the modern positive psychology movement (see Chapter 1). (pp. 198, 215)

B. F. Skinner (1904–1990) American psychologist who developed the operant conditioning model of learning; emphasized studying the relationship between environmental factors and observable actions, not mental processes, in trying to achieve a scientific explanation of behavior. (p. 201)

Edward L. Thorndike (1874–1949) American psychologist who was the first to experimentally study animal behavior and document how active behaviors are influenced by their consequences; postulated the law of effect. (p. 200)

Edward C. Tolman (1898–1956) American psychologist who used the terms *cognitive map* and *latent learning* to describe experimental findings that strongly suggested that cognitive factors play a role in animal learning. (p. 213)

John B. Watson (1878–1958) American psychologist who, in the early 1900s, founded behaviorism, an approach that emphasizes the scientific study of outwardly observable behavior rather than subjective mental states. (p. 190)

CONCEPT REVIEW ANSWERS

5.1 page 189

1. (a) baby crying; (b) nursing baby; (c) let-down reflex, breast milk flows; (d) baby's cry; (e) let-down reflex, breast milk flows
2. (a) lake; (b) leeches; (c) disgust; (d) lake; (e) disgust
3. (a) doorbell; (b) scary monster; (c) fear; (d) doorbell; (e) fear

5.2 page 209

1. positive reinforcement
2. negative reinforcement
3. punishment by removal
4. punishment by application
5. negative reinforcement
6. punishment by application
7. punishment by removal

5.3 page 213

1. fixed ratio
2. variable interval
3. fixed interval
4. variable interval
5. variable ratio
6. fixed interval

5.4 page 225

1. latent learning; Edward L. Tolman
2. operant conditioning; B. F. Skinner
3. observational learning; Albert Bandura
4. instinctive drift; Marian and Keller Breland
5. classical conditioning; John B. Watson

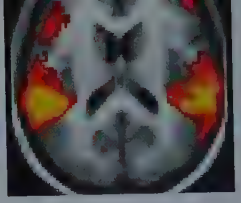


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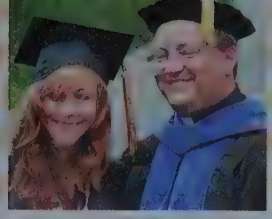


CHAPTER 6

Memory







The Drowning

PROLOGUE

ELIZABETH WAS ONLY 14 YEARS OLD when her mother drowned. Although Elizabeth remembered many things about visiting her Uncle Joe's home in Pennsylvania that summer, her memory of the details surrounding her mother's death had always been hazy. As she explained:

> *In my mind I've returned to that scene many times, and each time the memory gains weight and substance. I can see the cool pine trees, smell their fresh tarry breath, feel the lake's algae-green water on my skin, taste Uncle Joe's iced tea with fresh-squeezed lemon. But the death itself was always vague and unfocused. I never saw my mother's body, and I could not imagine her dead. The last memory I have of my mother was her tiptoed visit the evening before her death, the quick hug, the whispered, "I love you."*

Some 30 years later, at her Uncle Joe's 90th birthday party, Elizabeth learned from a relative that she had been the one to discover her mother's body in Uncle Joe's swimming pool. With this realization, memories that had eluded Elizabeth for decades began to come back.

> *The memories began to drift back, slow and unpredictable, like the crisp piney smoke from the evening campfires. I could see myself, a thin, dark-haired girl, looking into the flickering blue-and-white pool. My mother, dressed in her nightgown, is floating face down. "Mom? Mom?" I ask the question several times, my voice rising in terror. I start screaming. I remember the police cars, their lights flashing, and the stretcher with the clean, white blanket tucked in around the edges of the body. The memory had been there all along, but I just couldn't reach it.*

As the memory crystallized, it suddenly made sense to Elizabeth why she had always felt haunted by her vague memories of the circumstances surrounding her mother's death. And it also seemed to explain, in part, why she had always been so fascinated by the topic of memory.

However, several days later, Elizabeth learned that the relative had been wrong—it was *not* Elizabeth who discovered her mother's body, but her Aunt Pearl. Other relatives confirmed that Aunt Pearl had been the one who found Elizabeth's mother in the swimming pool. Yet Elizabeth's memory had seemed so real.

The Elizabeth in this true story is Elizabeth Loftus, a psychologist who is nationally recognized as the leading expert on the distortions that can occur in the memories of eyewitnesses. Loftus shares this personal story in her book *The Myth of Repressed Memory: False Memories and Allegations of Sexual Abuse.*

In this chapter, we'll consider the psychological and biological processes that underlie how memories are formed and forgotten. As you'll see, memory distortions such as the one Elizabeth Loftus experienced are relatively common. By the end of this chapter, you'll have a much better understanding of the memory process, including the reason that Elizabeth's "memory" of finding her mother's body seemed so real.

IN THIS CHAPTER:

- Introduction: What Is Memory?
- Retrieval: Getting Information from Long-Term Memory
- Forgetting: When Retrieval Fails
- Imperfect Memories: Errors, Distortions, and False Memories
- The Search for the Biological Basis of Memory
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Superpower Memory in Minutes per Day!

Introduction: What Is Memory?

KEY THEME

› Memory is a group of related mental processes that are involved in acquiring, storing, and retrieving information.

KEY QUESTIONS

› What are encoding, storage, and retrieval?
› What is the stage model of memory?
› What are the nature and function of sensory memory?

Like Elizabeth's memories of her uncle's home, memories can be vivid and evoke intense emotions. We can conjure up distinct memories that involve all our senses, including smells, sounds, and even tactile sensations. For example, close your eyes and try to recall the feeling of rain-soaked clothes against your skin, the smell of popcorn, and the sound of the half-time buzzer during a high school basketball game.

Memory refers to the mental processes that enable us to acquire, retain, and retrieve information. Rather than being a single process, memory involves three fundamental processes: *encoding*, *storage*, and *retrieval*.

Encoding refers to the process of transforming information into a form that can be entered and retained by the memory system. For example, to memorize the definition of a key term that appears on a textbook page, you would visually *encode* the patterns of lines and dots on the page as meaningful words that could be retained by your memory. **Storage** is the process of retaining information in memory so that it can be used at a later time. **Retrieval** involves recovering the stored information so that we are consciously aware of it.



Steve Mason/Photolibrary

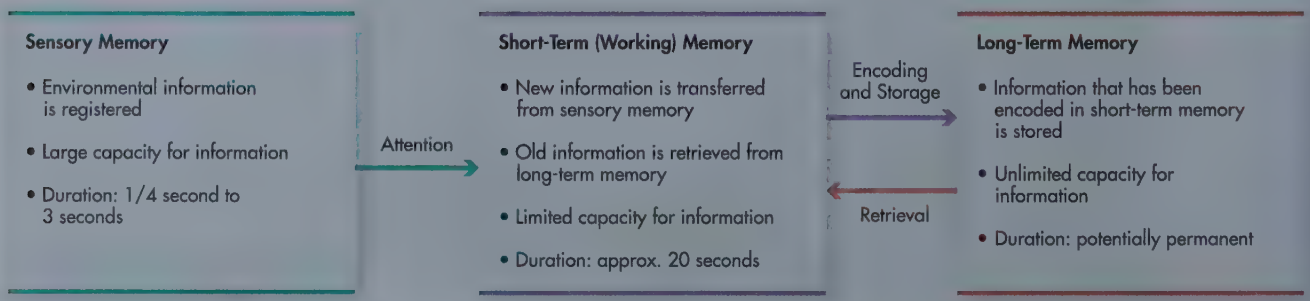
Memories Can Involve All Your Senses Think back to a particularly memorable experience from your high school years. Can you conjure up vivid memories of smells, tastes, sounds, or emotions associated with that experience? In the years to come, these friends may remember many sensory details associated with this summer cookout.

The Stage Model of Memory

No single model has been shown to capture all aspects of human memory (Baddeley & others, 2009; Tulving, 2007). However, one very influential model, the **stage model of memory,** is useful in explaining the basic workings of memory. In this model, shown in Figure 6.1, memory involves three distinct stages: *sensory memory*, *short-term memory*, and *long-term memory* (Atkinson & Shiffrin, 1968; Shiffrin & Atkinson, 1969). The stage model is based on the idea that information is *transferred* from one memory stage to another.

The first stage of memory is called *sensory memory*. **Sensory memory** registers a great deal of information from the environment and holds it for a very brief period of time. After three seconds or less, the information fades. Think of your sensory memory as an internal camera that continuously takes "snapshots" of your surroundings. With each snapshot, you momentarily focus your attention on specific details. Almost instantly, the snapshot fades, only to be replaced by another.

FIGURE 6.1 Overview of the Stage Model of Memory



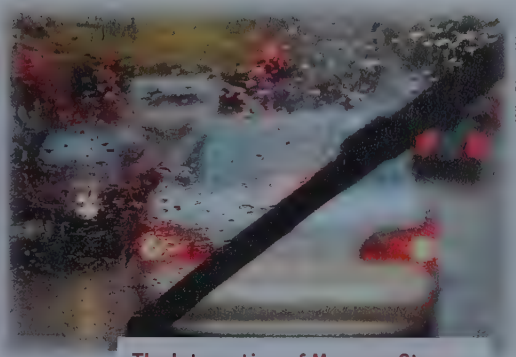
During the very brief time the information is held in sensory memory, you "select," or pay *attention* to, just a few aspects of all the environmental information that's being registered. While studying, for example, you focus your attention on one page of your textbook, ignoring other environmental stimuli. The information you select from sensory memory is important because this information is transferred to the second stage of memory, *short-term memory*.

Short-term memory refers to the active, working memory system. Your short-term memory temporarily holds all the information you are currently thinking about or consciously aware of. That information is stored briefly in short-term memory—for up to about 20 seconds. Because you use your short-term memory to actively process conscious information in a variety of ways, short-term memory is often referred to as *working memory* (Baddeley, 1995, 2007, 2010). Imagining, remembering, and problem solving all take place in short-term memory.

Over the course of any given day, vast amounts of information flow through your short-term memory. Most of this information quickly fades and is forgotten in a matter of seconds. However, some of the information that is actively processed in short-term memory may be encoded for storage in long-term memory.

Long-term memory, the third memory stage, represents what most people typically think of as memory—the long-term storage of information, potentially for a lifetime. It's important to note that the transfer of information between short-term and long-term memory goes two ways. Not only does information flow from short-term memory to long-term memory, but much information also flows in the other direction, from long-term memory to short-term memory.

If you think about it, this makes a great deal of sense. Consider a routine cognitive task, such as carrying on a conversation. Such tasks involve processing current sensory data and retrieving relevant stored information, such as the meaning of individual words. In the next few sections, we'll describe each of the stages of memory in more detail.



Mike Rinnan/Alamy

The Interaction of Memory Stages in Everyday Life Imagine driving on a busy street in pouring rain. How might each of your memory stages be involved in successfully navigating the wet streets? What kinds of information would be transferred from sensory memory and retrieved from long-term memory?

Sensory Memory

Fleeting Impressions of the World

Has something like this ever happened to you? You're engrossed in watching a suspenseful movie. From another room, a family member calls out, "Where'd you put the phone book?" You respond with, "What?" Then, a split second later, the question registers in your mind. Before the other person can repeat the question, you reply, "Oh. It's on the kitchen counter."

You were able to answer the question because your *sensory memory* registered and preserved the other person's words for a few fleeting seconds—just long enough for you to recall what had been said to you while your attention was focused on the movie. Sensory memory stores a detailed record of a sensory experience, but only for a few seconds at the most.

The Duration of Sensory Memory

It Was There Just a Split Second Ago!

The characteristics of visual sensory memory were first identified largely through the research of psychologist **George Sperling** in 1960. In his experiment, Sperling flashed the images of 12 letters on a screen for one-twentieth of a second. The letters were arranged in 4 rows of 3 letters each. Subjects focused their attention on the screen and, immediately after the screen went blank, reported as many letters as they could remember.

On average, subjects could report only 4 or 5 of the 12 letters. However, several subjects claimed that they had actually seen *all* the letters but that the complete image had faded from their memory as they spoke, disappearing before they could verbally report more than 4 or 5 letters.

- **memory** The mental processes that enable you to retain and retrieve information over time.
- **encoding** The process of transforming information into a form that can be entered into and retained by the memory system.
- **storage** The process of retaining information in memory so that it can be used at a later time.
- **retrieval** The process of recovering information stored in memory so that we are consciously aware of it.
- **stage model of memory** A model describing memory as consisting of three distinct stages: sensory memory, short-term memory, and long-term memory.
- **sensory memory** The stage of memory that registers information from the environment and holds it for a very brief period of time.
- **short-term memory** The active stage of memory in which information is stored for up to about 20 seconds.
- **long-term memory** The stage of memory that represents the long-term storage of information.



George Sperling Sperling carried out his research on the duration of sensory memory while still a graduate student at Harvard. Now at the University of California–Irvine, he continues to study perception, attention, and cognition.

Courtesy of George Sperling

On the basis of this information, Sperling tried a simple variation on the original experiment (see Figure 6.2). He arranged the 12 letters in 3 rows of 4 letters each. Then, immediately *after* the screen went blank, he sounded a high-pitched, medium-pitched, or low-pitched tone. If the subjects heard the high-pitched tone, they were to report the letters in the top row; the medium-pitched tone signaled the middle row; and the low-pitched tone signaled the bottom row. If the subjects actually did see all the letters, Sperling reasoned, then they should be able to report the letters in a given row by focusing their attention on the indicated row *before* their visual sensory memory faded.

This is exactly what happened. If the tone followed the letter display in under one-third of a second, subjects could accurately report about 3 of the 4 letters in whichever row was indicated by the tone. However, if the interval between the screen going blank and the sound of the tone was more than one-third of a second, the accuracy of the reports decreased dramatically. By the time one second had elapsed, the image in the subject's visual sensory memory had already faded beyond recall.

Sperling's classic experiment demonstrated that our visual sensory memory holds a great deal of information very briefly, for about half a second. This information is available just long enough for us to pay attention to specific elements that are significant to us at that moment. This meaningful information is then transferred from the very brief storage of sensory memory to the somewhat longer storage of short-term memory.

Types of Sensory Memory

Pick a Sense, Any Sense!

Memory researchers believe there is a separate sensory memory for each sense—vision, hearing, touch, smell, and so on. Of the different senses, however, visual and auditory sensory memories have been the most thoroughly studied. *Visual sensory memory* is sometimes referred to as *iconic memory* because it is the brief memory of an image, or *icon*. *Auditory sensory memory* is sometimes referred to as *echoic memory*, meaning a brief memory that is like an *echo*.

Researchers have found slight differences in the duration of sensory memory for visual and auditory information. Your visual sensory memory typically holds an image of your environment for about one-quarter to one-half second before it is replaced by yet another overlapping "snapshot." This is easy to demonstrate. Quickly wave a pencil back and forth in front of your face. Do you see the fading image of the pencil trailing behind it? That's your visual sensory memory at work. It momentarily holds the snapshot of the environmental image you see before it is almost instantly replaced by another overlapping image.

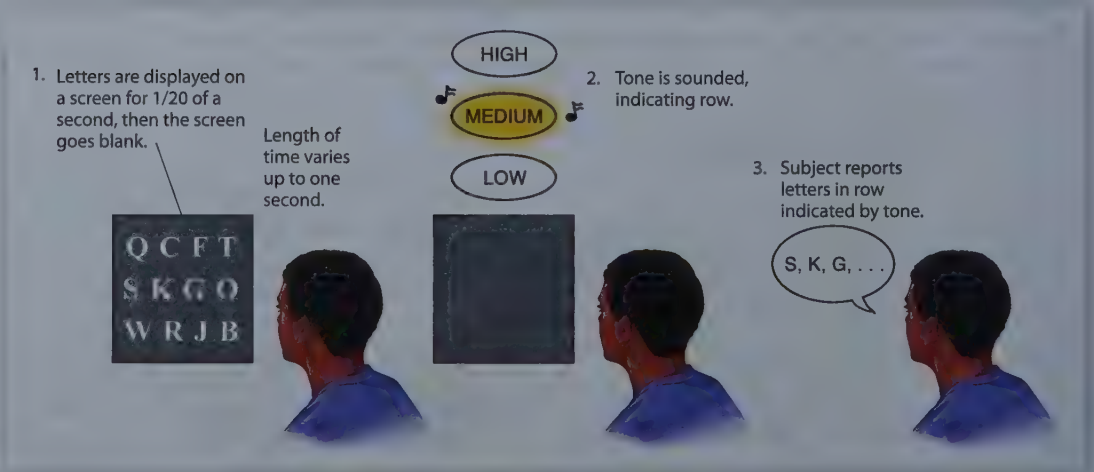


FIGURE 6.2 Sperling's Experiment Demonstrating the Duration of Sensory Memory In George Sperling's (1960) classic experiment, (1) subjects stared at a screen on which rows of letters were projected for just one-twentieth of a second, then the screen went blank. (2) After intervals varying up to one second, a tone was sounded that indicated the row of letters the subject should report. (3) If the tone was sounded within about one-third of a second, subjects were able to report the letters in the indicated row because the image of *all* the letters was still in sensory memory.

Your auditory sensory memory holds sound information a little longer, up to three or four seconds. This brief auditory sensory trace for sound allows you to hear speech as continuous words, or a series of musical notes as a melody, rather than as disjointed sounds. It also explains why you are able to "remember" something that you momentarily don't "hear," as in the example of the family member asking you where the phone book is.

An important function of sensory memory is to very briefly store sensory impressions so that they overlap slightly with one another. Thus, we perceive the world around us as continuous, rather than as a series of disconnected visual images or disjointed sounds.



Travis Morrise/The Hutchinson News

Perception and Sensory Memory Traces Because your visual sensory memory holds information for a fraction of a second before it fades, rapidly presented stimuli overlap and appear continuous. Thus, you perceive the separate blades of a rapidly spinning windmill as a smooth blur of motion. Similarly, you perceive a lightning bolt streaking across the sky as continuous even though it is actually three or more separate bolts of electricity.

Short-Term, Working Memory

The Workshop of Consciousness

KEY THEME

› Short-term memory provides temporary storage for information transferred from sensory and long-term memory.

KEY QUESTIONS

› What are the duration and capacity of short-term memory?

› How can you overcome the limitations of short-term memory?

› What are the main components of Baddeley's model of working memory?

You can think of *short-term memory,* or *working memory,* as the "workshop" of consciousness. It is the stage of memory in which information transferred from sensory memory *and* information retrieved from long-term memory become conscious. When you recall a past event or mentally add two numbers, the information is temporarily held and processed in your short-term memory. Your short-term memory also allows you to make sense out of this sentence by holding the beginning of the sentence in active memory while you read the rest of the sentence. Thus, short-term, working memory provides temporary storage for information that is currently being used in some conscious cognitive activity.

The Duration of Short-Term Memory

Going, Going, Gone!

Information in short-term memory lasts longer than information in sensory memory, but its duration is still very short. Estimates vary, but generally you can hold most types of information in short-term memory up to about 20 seconds before it's forgotten (Peterson & Peterson, 1959). However, information can be maintained in short-term memory if it is *rehearsed,* or repeated, over and over. Because consciously rehearsing information will maintain it in short-term memory, this process is called **maintenance rehearsal.** For example, suppose that you decide to order a pizza for yourself and some friends. You look up the number and mentally rehearse it until you can dial the phone.

Information that is *not* actively rehearsed is rapidly lost. Why? One possible explanation is that information that is not maintained by rehearsal simply fades away, or *decays,* with the passage of time. Another potential cause of forgetting in short-term memory is *interference* from new or competing information (Baddeley, 2002; Nairne, 2002). For example, if you are distracted by one of your

maintenance rehearsal The mental or verbal repetition of information in order to maintain it beyond the usual 20-second duration of short-term memory.

chunking Increasing the amount of information that can be held in short-term memory by grouping related items together into a single unit, or *chunk*.

friends asking you a question before you dial the pizza place, your memory of the phone number will quickly evaporate. Interference may also explain the irritating experience of forgetting someone's name just moments after you're introduced to him or her. If you engage the new acquaintance in conversation without rehearsing his or her name, the conversation may "bump" the person's name out of your short-term memory.

The Capacity of Short-Term Memory

So That's Why There Were Seven Dwarfs!

Demonstration of Short-Term Memory Capacity

Row 1 — 8 7 4 6
Row 2 — 3 4 9 6 2
Row 3 — 4 2 7 7 1 6
Row 4 — 5 1 4 0 8 1 3
Row 5 — 1 8 3 9 5 5 2 1
Row 6 — 2 1 4 9 7 5 2 4 8
Row 7 — 9 3 7 1 0 4 2 8 9 7
Row 8 — 7 1 9 0 4 2 6 0 4 1 8

Along with having a relatively short duration, short-term memory also has a relatively limited capacity. This is easy to demonstrate. Take a look at the numbers in the margin. If you've got a friend handy who's willing to serve as your research subject, simply read the numbers out loud, one row at a time, and ask your friend to repeat them back to you in the same order. Try to read the numbers at a steady rate, about one per second. Note each row that he correctly remembers.

How many numbers could your friend repeat accurately? Most likely, he could correctly repeat between five and nine numbers. That's what psychologist George Miller (1956) described as the limits of short-term memory in a classic paper titled "The Magical Number Seven, Plus or Minus Two." Miller believed that the capacity of short-term memory is limited to about seven items, or bits of information, at one time. It's no accident that local telephone numbers are seven digits long (Cowan & others, 2004).

So what happens when your short-term memory store is filled to capacity? New information *displaces,* or bumps out, currently held information. Maintenance rehearsal is one way to avoid the loss of information from short-term memory. By consciously repeating the information you want to remember, you keep it active in short-term memory and prevent it from being displaced by new information.

U A V F C I D B D S A I

Although the capacity of your short-term memory is limited, there are ways to increase the amount of information you can hold in short-term memory at any given moment. To illustrate this point, let's try another short-term memory demonstration. Read the sequence of letters in the margin, then close your eyes and try to repeat the letters out loud in the same order.

How many letters were you able to remember? Unless you have an exceptional short-term memory, you probably could not repeat the whole sequence correctly. Now try this sequence of letters: D V D F B I U S A C I A.

You probably managed the second sequence with no trouble at all, even though it is made up of exactly the same letters as the first sequence. The ease with which you handled the second sequence demonstrates **chunking**—the grouping of related items together into a single unit. The first letter sequence was perceived as 12 separate items and probably exceeded your short-term memory's capacity. But the second letter sequence was perceived as only four "chunks" of information, which you easily remembered: DVD, FBI, USA, and CIA. Thus, chunking can increase the amount of information held in short-term memory. But to do so, chunking also often involves the retrieval of meaningful information from *long-term memory,* such as the meaning of the initials FBI (Baddeley & others, 2010).

The basic principle of chunking is incorporated into many numbers that we need to remember. Long strings of identification numbers, such as Social Security numbers or credit card numbers, are usually broken up by hyphens or spaces so that you can chunk them easily.

Not every memory researcher accepts that short-term memory is limited to exactly seven items, plus or minus two. Over the half-century since the publication of Miller's classic article, researchers have challenged the seven-item limit (Jonides & others, 2008; Cowan & others, 2007). Current research suggests that the true "magical number" is more likely to be *four plus or minus one* than *seven plus or minus two* (Cowan & others, 2007; Cowan, 2010).

Cognitive psychologist Nelson Cowan (2001, 2005, 2010) believes that the type of stimuli used in many short-term memory tests has led researchers to overestimate its capacity. Typically, such memory tests use lists of letters, numbers, or words. According to Cowan, many people *automatically* chunk such stimuli to help remember them. For example, even seemingly random numbers may be easily associated with a date, an address, or another familiar number sequence.

To overcome this tendency, Jeffrey Rouder and his colleagues (2008) used a simple visual stimulus instead of a sequence of numbers, letters, or words. The memory task? Remembering the position of colored squares on a computer screen. In this and similar studies, participants were able to hold only three or four items in their short-term memory at a time. Thus, most researchers today believe that the capacity of working memory is no more than about three to four items at a time when chunking is not an option (Saults & Cowan, 2007; Cowan, 2010).

Whether the "magic number" is four or seven, the point remains: Short-term memory has a limited number of mental "slots" for information. Chunking can increase the amount of information held in each slot, but the number of slots is still limited.

working memory The temporary storage and active, conscious manipulation of information needed for complex cognitive tasks, such as reasoning, learning, and problem solving.

From Short-Term Memory to Working Memory

Our discussion of the short-term memory store has so far focused on just one type of information—verbal or acoustic codes, that is, speech-like stimuli that we can mentally recite. Lists of numbers, letters, words, or other items fall into this category. However, if you think about it, we also use our short-term memory to temporarily store and manipulate other types of stimuli, such as visual images. For example, suppose you're out shopping with a close friend who asks you whether you think a particular chair will match her living room furniture. Before you respond, you need to call up and hold a mental image of her living room. You are surely using your short-term memory as you consider her question, but how?

In this example, you are actively processing information in a short-term memory system that is often referred to as working memory. Although the terms *working memory* and *short-term memory* are sometimes used interchangeably, **working memory** refers to the active, conscious manipulation of temporarily stored information. You use your working memory when you engage in problem solving, reasoning, language comprehension, and mental comparisons. In contrast, short-term memory is more likely to be used when the focus is on simpler memory processes, such as rehearsing lists of syllables, words, or numbers (Baddeley, 2010).

The best-known model of working memory was developed by British psychologist Alan Baddeley. In Baddeley's (1992, 2007) model of working memory, there are three main components, each of which can function independently (see Figure 6.3).

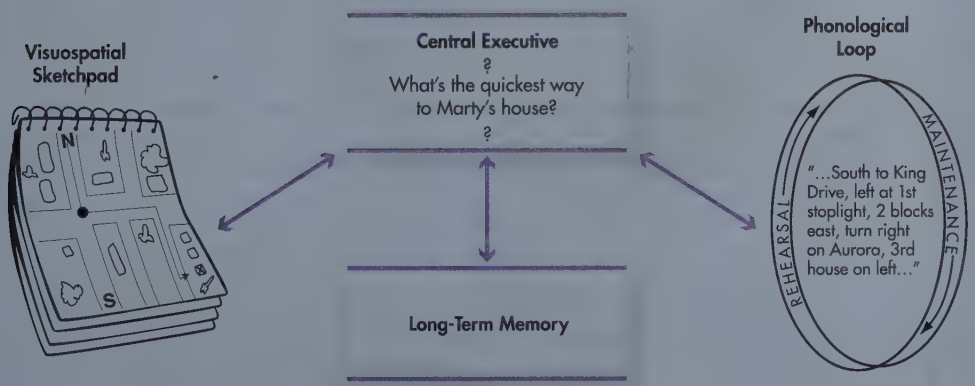


FIGURE 6.3 Baddeley's Model of Working Memory: How Do I Get to Marty's House? Suppose you are trying to figure out the fastest way to get to a friend's house. In Baddeley's model of working memory, you would use the *phonological loop* to verbally recite the directions. Maintenance rehearsal helps keep the information active in the phonological loop. You would use the *visuospatial sketchpad* to imagine your route and any landmarks along the way. The *central executive* actively processes and integrates information from the phonological loop, the visuospatial sketchpad, and long-term memory.



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"Did you ever start to do something and then forget what the heck it was?"

One component, called the *phonological loop,* is specialized for verbal material, such as lists of numbers or words. This is the aspect of working memory that is often tested by standard memory tasks (Mueller & others, 2003). The second component, called the *visuospatial sketchpad,* is specialized for spatial or visual material, such as remembering the layout of a room or city.

The third component is what Baddeley calls the *central executive,* which controls attention, integrates information, and manages the activities of the phonological loop and the visuospatial sketchpad. The central executive also initiates retrieval and decision processes as necessary and integrates information coming into the system.

Long-Term Memory

KEY THEME

› Once encoded, an unlimited amount of information can be stored in long-term memory, which has different memory systems.

KEY QUESTIONS

› What are ways to improve the effectiveness of encoding?

› How do procedural, episodic, and semantic memories differ, and what are implicit and explicit memory?

› How does the semantic network model explain the organization of long-term memory?

Long-term memory refers to the storage of information over extended periods of time. Technically, any information stored longer than the roughly 20-second duration of short-term memory is considered to be stored in long-term memory. In terms of maximum duration, some long-term memories last a lifetime.

In contrast to the limited capacities of sensory and short-term memory, the amount of information that can be held in long-term memory is limitless. Granted, it doesn't always feel limitless, but consider this: Every day, you remember the directions to your college; the names of hundreds of friends, relatives, and acquaintances; and how to start your car. Retrieving information from long-term memory happens quickly and with little effort—most of the time.



Dan Reynolds, Cartoonstock.com

Encoding Long-Term Memories

How does information get "into" long-term memory? One very important function that takes place in short-term memory is *encoding,* or transforming the new information into a form that can be retrieved later (see Figure 6.4). As a student, you may have tried to memorize dates, facts, or definitions by simply repeating them to yourself over and over. This strategy reflects an attempt to use maintenance rehearsal to encode material into long-term memory. However, maintenance rehearsal is *not* a very effective strategy for encoding information into long-term memory.

A much more effective encoding strategy is **elaborative rehearsal,** which involves focusing on the *meaning* of information to help encode and transfer it to long-term memory. With elaborative rehearsal, you relate the information to other information you already know. That is, rather than simply repeating the information, you *elaborate* on the new information in some meaningful way.

Elaborative rehearsal significantly improves memory for new material. This point is especially important for students, because elaborative rehearsal is a helpful study strategy. Here's an example of how you might use elaborative rehearsal to improve your memory for new information. In Chapter 2 we discussed three brain structures that are part of the limbic system: the *hypothalamus,* the *hippocampus,* and the *amygdala.* If you tried to memorize the definitions of these structures by reciting them over and over to yourself, you engaged in the not-so-effective memory strategy of maintenance rehearsal.

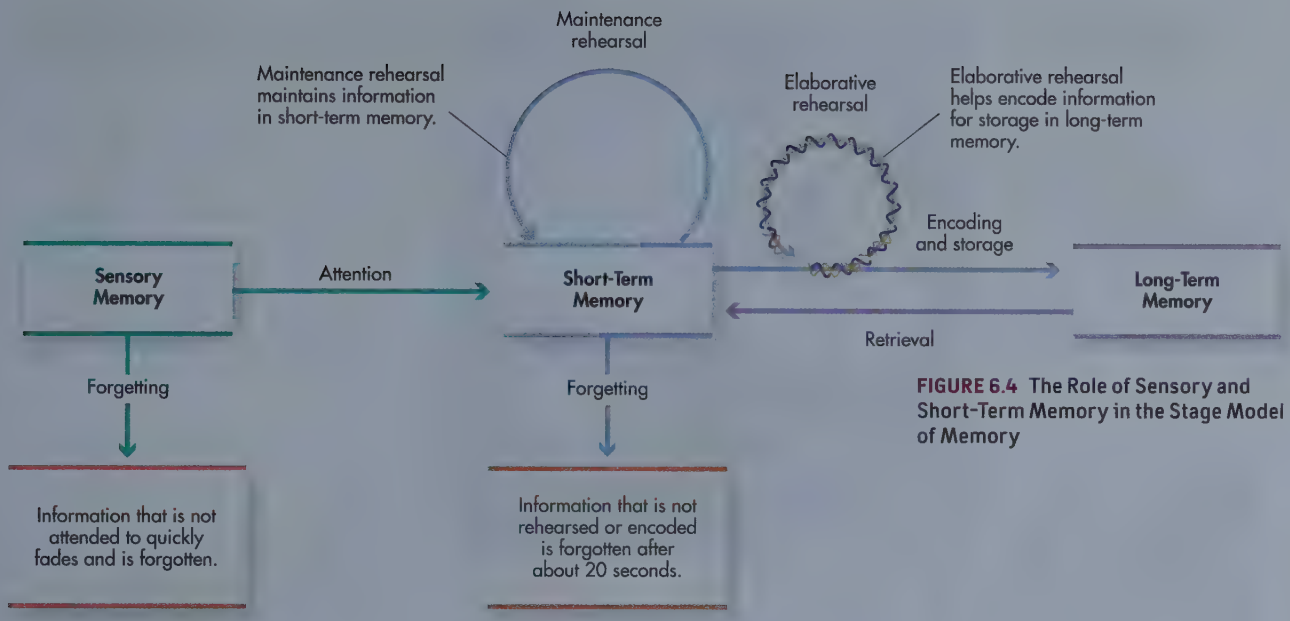


FIGURE 6.4 The Role of Sensory and Short-Term Memory in the Stage Model of Memory

But if you elaborated on the information in some meaningful way, you would be more likely to recall it. For example, you could think about the limbic system's involvement in emotions, memory, and motivation by constructing a simple story. "I knew it was lunchtime because my hypothalamus told me I was *h*ungry, *th*irsty, and cold. My hippocampus helped me remember a new restaurant that opened on *cam-pus,* but when I got there I had to wait in line and my amygdala reacted with *a*nger." The story may be a bit silly, but many studies have shown that elaborative rehearsal leads to better retention (Lockhart & Craik, 1990).

Creating this simple story to help you remember the limbic system illustrates two additional factors that enhance encoding. First, applying information to yourself, called the *self-reference effect,* improves your memory for information. Second, the use of *visual imagery,* especially vivid images, also enhances encoding (Kesebir & Oishi, 2010; Paivio, 2007).

The fact that elaborative rehearsal results in more effective encoding and better memory of new information has many practical applications for students. As you study:

- Make sure you understand the new information by restating it in your own words.
- Actively question new information.
- Think about the potential applications and implications of the material.
- Relate the new material to information you already know, searching for connections that make the new information more meaningful.
- Generate your own examples of the concept, especially examples from your own experiences.

At the end of the chapter, in Enhancing Well-Being with Psychology, we'll give you more suggestions for strategies you can use to improve your memory.

Types of Information in Long-Term Memory

There are three major categories of information stored in long-term memory (Tulving, 1985, 2002). **Procedural memory** refers to the long-term memory of how to perform different skills, operations, and actions. Typing, riding a bike, running, and making scrambled eggs are all examples of procedural information

elaborative rehearsal Rehearsal that involves focusing on the meaning of information to help encode and transfer it to long-term memory.

procedural memory Category of long-term memory that includes memories of different skills, operations, and actions.



Doug Menuez/PhotoDisc/Getty Images

Types of Information Stored in Long-Term Memory A memorable skateboard ride involves all three types of long-term memory. Remembering how to steer and balance on a skateboard are examples of *procedural memory*. Knowing the names of the different parts of a skateboard and the different kinds of skateboards available would be examples of *semantic memory*. And, if this young man forms a vivid memory of the day he rode his skateboard in a huge drainpipe, it will be an example of an *episodic memory*.

stored in long-term memory. We begin forming procedural memories early in life when we learn to walk, talk, feed ourselves, and so on.

Often, we can't recall exactly when or how we learned procedural information. And usually it's difficult to describe procedural memories in words. For example, try to describe *precisely* and *exactly* what you do when you blow-dry your hair, play the guitar, or ride a bicycle. A particular skill may be easy to demonstrate but very difficult to describe.

In contrast to procedural memory, **episodic memory** refers to your long-term memory of specific events or episodes, including the time and place that they occurred (Tulving, 2002). Your memory of attending a friend's wedding or your first day at college would both be examples of episodic memories. Closely related to episodic memory is *autobiographical memory,* which refers to the events of your life—your personal life history (Fivush, 2011). Autobiographical memory plays a key role in your sense of self (Ross & Wang, 2010). Does culture affect autobiographical memory? In the Culture and Human Behavior box, we examine the impact of culture on people's earliest memories.

The third category of long-term memory is **semantic memory**—general knowledge that includes facts, names, definitions, concepts, and ideas. Semantic memory represents your personal encyclopedia of accumulated data and trivia stored in your long-term memory. Typically, you store semantic memories in long-term memory *without* remembering when or where you originally acquired the information. For example, can you remember when or where you learned that there are different time zones across the United States? Or when you learned that there are nine innings in a baseball game?

Implicit and Explicit Memory

Two Dimensions of Long-Term Memory

Studies with patients who have suffered different types of amnesia as a result of damage to particular brain areas have led memory researchers to recognize that long-term memory is *not* a simple, unitary system. Instead, long-term memory appears to be composed of separate but interacting subsystems and abilities (Slotnick & Schacter, 2007).

What are these subsystems? One basic distinction that has been made is between *explicit memory* and *implicit memory*. **Explicit memory** is *memory with awareness*—information or knowledge that can be consciously recollected, including episodic and semantic information. Thus, remembering what you did last New Year's Day or the topics discussed in your last psychology class are both examples of explicit memory. Explicit memories are also called *declarative memories* because, if asked, you can "declare" the information.

In contrast, **implicit memory** is *memory without awareness*. Implicit memories cannot be consciously recollected, but they still affect your behavior, knowledge, or performance of some task. For example, let's assume that you are a pretty good typist. Imagine that we asked you to type the following phrase with your eyes closed: "most zebras cannot be extravagant." Easy, right? Now, without looking at a typewriter or computer keyboard, try reciting, from left to right, the seven letters of the alphabet that appear on the bottom row of a keyboard. Can you do it? Your authors are both expert typists, and neither one of us could do this. Chances are, you can't either. (In case you're wondering, the letters are *ZXCVBNM*.)

episodic memory Category of long-term memory that includes memories of particular events.

semantic memory Category of long-term memory that includes memories of general knowledge, concepts, facts, and names.

explicit memory Information or knowledge that can be consciously recollected; also called *declarative memory*.

implicit memory Information or knowledge that affects behavior or task performance but cannot be consciously recollected; also called *non-declarative memory*.

CULTURE AND HUMAN BEHAVIOR

Culture's Effects on Early Memories

For most adults, earliest memories are for events that occurred between the ages of 2 and 4. These early memories mark the beginning of autobiographical memory, which provides the basis for the development of an enduring sense of self (Fivush, 2011; Markowitsch & Staniloiu, 2011). Do cultural differences in the sense of self influence the content of our earliest memories?

Comparing the earliest memories of European American college students and Taiwanese and Chinese college students, developmental psychologist Qi (pronounced "chee") Wang (2001, 2006) found a number of significant differences. First, the average age for earliest memory was much earlier for the U.S.-born students than for the Taiwanese and Chinese students.

Wang also found that the Americans' memories were more likely to be discrete, one-point-in-time events reflecting individual experiences or feelings, such as "I remember getting stung by a bee when I was 3 years old. I was scared and started crying." In contrast, the earliest memories of both the Chinese and Taiwanese students were of general, routine activities with family, schoolmates, or community members, such as playing in the park or eating with family members.

For Americans, Wang notes, the past is like a drama in which the self plays the lead role. Themes of self-awareness and individual autonomy were more common in the American students' memories, which tended to focus on their own experiences, emotions, and thoughts.

In contrast, Chinese students were more likely to include other people in their memories. Rather than focusing exclusively on their own behavior and thoughts, their earliest memories were typically brief accounts that centered on collective activities. For the Chinese students, the self is not easily separated from its social context.

Wang (2007, 2008) believes that cultural differences in autobiographical memory are formed in very early childhood, through interaction with family members. For example, *shared reminiscing*—the way that mothers talk to their children about their past experiences—differs in Eastern and Western cultures (Fivush, 2011). When Asian mothers reminisce with their children, they tend to talk about group settings or situations, and to de-emphasize emotions, such as anger, that might separate the child from the group. In comparison, Western mothers tend to focus more on the child's individual activities, accomplishments, and emotional reactions (Ross & Wang, 2010). As Katherine Nelson and Robyn Fivush (2004) observe, such conversations about the personal past "provide children with information about how to be a 'self' in their culture."



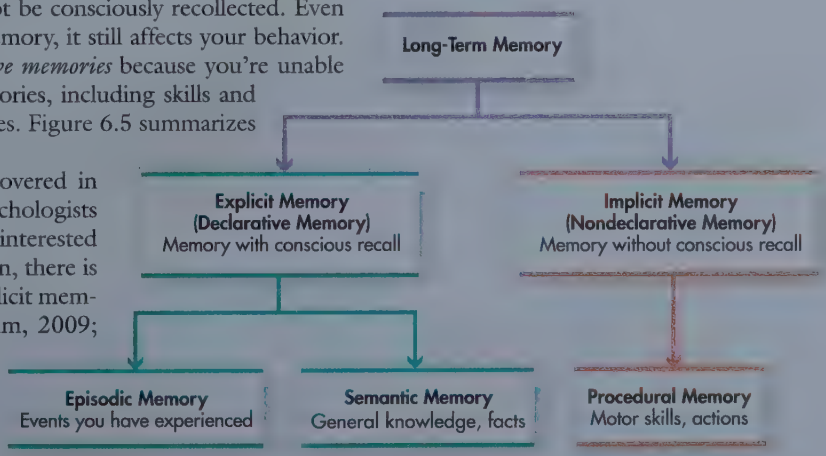
Dean Conger/Corbis

Culture and Earliest Memories Psychologist Qi Wang (2001, 2006) found that the earliest memories of Chinese and Taiwanese adults tended to focus on routine activities that they shared with other members of their family or social group rather than individual events. Perhaps years from now, these children will remember walking with their preschool friends to play in the park.

Here's the point: Your ability to type the phrase "most zebras cannot be extravagant" without looking demonstrates that you *do* know the location of the letters *Z, X, C, V, B, N,* and *M*. But your inability to recite that knowledge demonstrates that your memory of each key's location cannot be consciously recollected. Even though you're not consciously aware of the memory, it still affects your behavior. Implicit memories are also called *nondeclarative memories* because you're unable to "declare" the information. Procedural memories, including skills and habits, typically reflect implicit memory processes. Figure 6.5 summarizes the different types of long-term memory.

Although much of the memory research covered in this chapter centers on explicit memory, psychologists and neuroscientists have become increasingly interested in implicit memory. As we'll see in a later section, there is growing evidence that implicit memory and explicit memory involve different brain regions (Eichenbaum, 2009; Thompson, 2005). Some memory theorists believe that implicit memory and explicit memory are two distinct memory systems (Kihlstrom & others, 2007; Tulving, 2002).

FIGURE 6.5 Types of Long-Term Memory



chair	apple
boat	car
footstool	airplane
orange	lamp
pear	banana
peach	dresser
bed	sofa
bus	bookcase
train	truck
plum	table
grapes	strawberry
motorcycle	bicycle

FIGURE 6.6 Clustering Demonstration
Study the words on this list for one minute. Then count backward by threes from 108 to 0. When you've completed that task, write down as many of the words from the list as you can remember.

The Organization of Information in Long-Term Memory

Exactly how information is organized in long-term memory is not completely understood by memory researchers. Nonetheless, memory researchers know that information in long-term memory is *clustered* and *associated*.

Clustering means organizing items into related groups, or *clusters*, during recall. Before reading further, try the demonstration in Figure 6.6. Even though the words are presented in random order, you probably recalled groups of vehicles, fruits, and furniture. In other words, you organized the bits of information by clustering them into related categories.

Different bits and pieces of information in long-term memory are also logically linked, or associated. For example, what's the first word that comes to your mind in response to the word *red*? When we asked our students that same question, their top five responses were "blue," "apple," "color," "green," and "rose." Even if you didn't answer with one of the same associations, your response was based on some kind of logical association that you could explain if asked.

Memory researchers have developed several models to show how information is organized in long-term memory. One of the best-known models is called the **semantic network model** (Collins & Loftus, 1975). When one concept is activated in the semantic network, it can *spread* in any number of directions, *activating* other associations in the semantic network. For example, the word *red* might activate "blue" (another color), "apple," "fire truck" (objects that are red), or "alert" (as in the phrase, "red alert"). In turn, these associations can activate other concepts in the network.

The semantic network model is a useful way of conceptualizing how information is organized in long-term memory. However, keep in mind that it is just a metaphor, not a physical structure in the brain. Nevertheless, the fact that information *is* organized in long-term memory has important implications for the retrieval process, as you'll see in the next section.

CONCEPT REVIEW 6.1

Comparing the Three Stages of Memory

Identify each of the following descriptions as characteristic of sensory memory (SM), short-term memory (STM), or long-term memory (LTM).

Function

1. Storage of information for later retrieval _____
2. Brief storage of sensory impressions _____
3. Temporary storage of new information; interaction with stored information _____

Duration

4. Potentially permanent _____
5. Approximately 20 seconds _____
6. Approximately 1/2 to 3 seconds _____

Capacity

7. Limited capacity of about seven items _____
8. Large but fleeting capacity _____
9. Unlimited capacity _____



Retrieval

Getting Information from Long-Term Memory

KEY THEME

› Retrieval refers to the process of accessing and retrieving stored information in long-term memory.

KEY QUESTIONS

› What are retrieval cues and how do they work?
› What do tip-of-the-tongue experiences tell us about the nature of memory?
› How is retrieval tested, and what is the serial position effect?

So far, we've discussed some of the important factors that affect encoding and storing information in memory. In this section, we will consider factors that influence the retrieval process. Before you read any further, try the demonstration in Figure 6.7.

After completing part (a) on this page, turn the page and try part (b). We'll refer to this demonstration throughout this section, so please take a shot at it. After you've completed both parts of the demonstration, continue reading.

Instructions: Spend 3 to 5 seconds reading each of the following sentences, and read through the list only once. As soon as you are finished, cover the list and write down as many of the sentences as you can remember (you need not write "can be used" each time). Please begin now.

A brick can be used as a doorstop.
A ladder can be used as a bookshelf.
A wine bottle can be used as a candleholder.
A pan can be used as a drum.
A fork can be used to comb hair.
A guitar can be used as a canoe paddle.
A leaf can be used as a bookmark.
An orange can be used to play catch.
A newspaper can be used to swat flies.
A T-shirt can be used as a coffee filter.
A sheet can be used as a sail.
A boat can be used as a shelter.
A bathtub can be used as a punch bowl.
A flashlight can be used to hold water.
A rock can be used as a paperweight.
A knife can be used to stir paint.
A pen can be used as an arrow.
A barrel can be used as a chair.
A rug can be used as a bedspread.
A CD can be used as a mirror.
A scissors can be used to cut grass.
A board can be used as a ruler.
A balloon can be used as a pillow.
A shoe can be used to pound nails.
A dime can be used as a screwdriver.
A lampshade can be used as a hat.

Now that you've recalled as many sentences as you can, turn to Figure 6.7(b) on the next page.

FIGURE 6.7(a) Demonstration of Retrieval Cues

Source: Adapted from Bransford & Stein (1993).

The Importance of Retrieval Cues

Retrieval refers to the process of accessing, or *retrieving*, stored information. There's a vast difference between what is stored in our long-term memory and what we can actually access. In many instances, our ability to retrieve stored memory hinges on having an appropriate retrieval cue. A **retrieval cue** is a clue, prompt, or hint that can help trigger recall of a stored memory. If your performance on the demonstration experiment in Figure 6.7 was like ours, the importance of retrieval cues should have been vividly illustrated.

Let's compare results. How did you do on the first part of the demonstration, in Figure 6.7(a)? Don initially remembered 12 pairs of items. Sandy blew Don out of the water on the first part—she remembered 19 pairs of items. Like us, you undoubtedly reached a point at which you were unable to remember any more pairs. At that point, you experienced **retrieval cue failure,** which refers to the inability to recall long-term memories because of inadequate or missing retrieval cues.

Your authors both did much better on the demonstration in Figure 6.7(b), and you probably did, too. (Sandy got 24 of 26, and Don got 26 of 26 words, except that he remembered "bedspread" as "blanket.") Why the improvement? In part (b) you were presented with retrieval cues that helped you access your stored memories.

This exercise demonstrates the difference between information that is *stored* in long-term memory versus the information that you can *access*. Many of the items on the list that you could not recall in part (a) were not forgotten. They were simply inaccessible—until you had a retrieval cue to help jog your memory. This exercise illustrates that many memories only *appear* to be forgotten. With the right retrieval cue, you can often access stored information that seemed to be completely unavailable.

Common Retrieval Glitches

The Tip-of-the-Tongue Experience

Quick—what was the name of the substance that could kill Superman? What was the name of Spiderman's uncle, who was killed in a robbery? If comic books aren't your thing, how about this question: Who wrote the words to "The Star-Spangled Banner"?

- **clustering** Organizing items into related groups during recall from long-term memory.
- **semantic network model** A model that describes units of information in long-term memory as being organized in a complex network of associations.
- **retrieval** The process of accessing stored information.
- **retrieval cue** A clue, prompt, or hint that helps trigger recall of a given piece of information stored in long-term memory.
- **retrieval cue failure** The inability to recall long-term memories because of inadequate or missing retrieval cues.

Instructions: Do not look back at the list of sentences in Figure 6.7(a). Use the following list as retrieval cues, and now write as many sentences as you can. Be sure to keep track of how many you can write down.

flashlight	lampshade
sheet	shoe
rock	guitar
CD	scissors
boat	leaf
dime	brick
wine bottle	knife
board	newspaper
pen	pan
balloon	barrel
ladder	rug
T-shirt	orange
fork	bathtub

FIGURE 6.7(b) Demonstration of Retrieval Cues

Source: Adapted from Bransford & Stein (1993).

Did any of these questions leave you feeling as if you knew the answer but just couldn't quite recall it? If so, you experienced a common, and frustrating, form of retrieval failure, called the **tip-of-the-tongue (TOT) experience.** The TOT experience refers to the inability to get at a bit of information that you're absolutely certain is stored in your memory. Subjectively, it feels as though the information is very close, but just out of reach—or on the tip of your tongue (Schwartz, 2002, 2011).

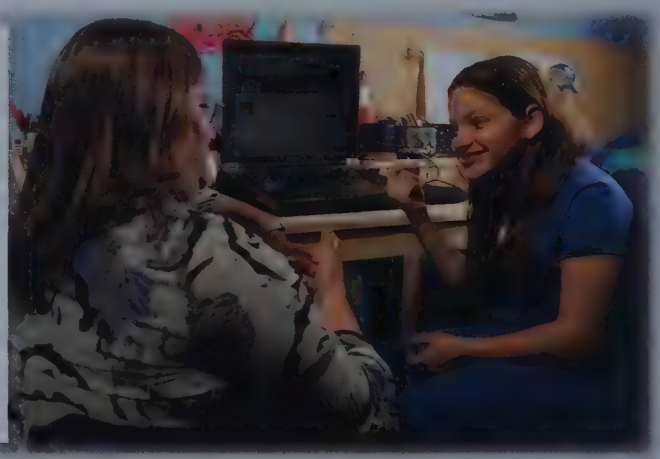
TOT experiences appear to be universal, and the "tongue" metaphor is used to describe the experience in many cultures (Schwartz, 1999; 2002; Brennen & others, 2007). On average, people have about one TOT experience per week. Although people of all ages experience such word-finding memory glitches, TOT experiences tend to be more common among older adults than younger adults (Farrell & Abrams, 2011).

When experiencing this sort of retrieval failure, people can almost always dredge up partial responses or related bits of information from their memory. About half the time, people can accurately identify the first letter of the target word and the number of syllables in it. They can also often produce words with similar meanings or sounds. While momentarily frustrating, about 90 percent of TOT experiences are eventually resolved, often within a few minutes.

Tip-of-the-tongue experiences illustrate that retrieving information is not an all-or-nothing process. Often, we remember bits and pieces of what we want to remember. In many instances, information is stored in memory but is not accessible without the right retrieval cues. TOT experiences also emphasize that information stored in memory is *organized* and connected in relatively logical ways. As you mentally struggle to retrieve the blocked information, logically connected bits of information are frequently triggered. In many instances, these related tidbits of information act as additional retrieval cues, helping you access the desired memory.

A "Tip-of-the-Fingers" Experience

American Sign Language (ASL) users sometimes have a "tip-of-the-fingers" experience when they are sure they know a sign but can't retrieve it. During a TOT experience, people are often able to remember the first letter or sound of the word they're struggling to remember. Similarly, ASL users tend to remember the hand shape, which appears as the signer begins to make the sign, rather than later parts of the sign, like the hand movement. For words that are finger-spelled, ASL users were more likely to recall the first letters than later letters (Thompson & others, 2005).



Michael Newman/PhotoEdit

Testing Retrieval

Recall, Cued Recall, and Recognition

The first part of the demonstration in Figure 6.7 illustrated the use of recall as a strategy to measure memory. **Recall,** also called *free recall,* involves producing information using no retrieval cues. This is the memory measure that's used on essay tests. Other than the essay questions themselves, an essay test provides no additional retrieval cues to help jog your memory.

The second part of the demonstration used a different memory measurement, called **cued recall.** Cued recall involves remembering an item of information in response to a retrieval cue. Fill-in-the-blank and matching questions are examples of cued-recall tests.

A third memory measurement is **recognition,** which involves identifying the correct information from several possible choices. Multiple-choice tests involve recognition as a measure of long-term memory. The multiple-choice question provides you with one correct answer and several wrong answers. If you have stored the information in your long-term memory, you should be able to recognize the correct answer.

Cued-recall and recognition tests are clearly to the student's advantage. Because these kinds of tests provide retrieval cues, the likelihood that you will be able to access stored information is increased.

The Serial Position Effect

Notice that the first part of the demonstration in Figure 6.7 did not ask you to recall the sentences in any particular order. Instead, the demonstration tested *free recall*—you could recall the items in any order. Take another look at your answers to Figure 6.7(a). Do you notice any sort of pattern to the items that you did recall?

Both your authors were least likely to recall items from the middle of the list. This pattern of responses is called the **serial position effect,** which refers to the tendency to retrieve information more easily from the beginning and the end of a list rather than from the middle. There are two parts to the serial position effect. The tendency to recall the first items in a list is called the *primacy effect,* and the tendency to recall the final items in a list is called the *recency effect.*

The primacy effect is especially prominent when you have to engage in *serial recall,* that is, when you need to remember a list of items in their original order. Remembering speeches, telephone numbers, and directions are a few examples of serial recall.

The Encoding Specificity Principle

KEY THEME

› According to the encoding specificity principle, re-creating the original learning conditions makes retrieval easier.

KEY QUESTIONS

› How can context and mood affect retrieval?

› What role does distinctiveness play in retrieval, and how accurate are flashbulb memories?

One of the best ways to increase access to information in memory is to re-create the original learning conditions. This simple idea is formally called the **encoding specificity principle** (Tulving, 1983). As a general rule, the more closely retrieval cues match the original learning conditions, the more likely it is that retrieval will occur.

For example, have you ever had trouble remembering some bit of information during a test but immediately recalled it as you entered the library where you normally study? When you intentionally try to remember some bit of information, such as the definition of a term, you often encode much more into memory than just that isolated bit of information. As you study in the library, at some level you're aware of all kinds of environmental cues. These cues might include the sights, sounds, and aromas within that particular situation. *The environmental cues in a particular context can become encoded as part of the unique memories you form while in that context.* These same environmental cues can act as retrieval cues to help you access the memories formed in that context.

This particular form of encoding specificity is called the context effect. The **context effect** is the tendency to remember information more easily when the retrieval occurs in the same setting in which you originally learned the information. Thus, the environmental cues in the library where you normally study act as additional retrieval cues that help jog your memory. Of course, it's too late to help your test score, but the memory was there.



AP Photo/Paul Spinelli

A Demonstration of the Serial Position Effect: "With white stripes and...ummm..." Christine Aguilera infamously botched the middle of "The Star-Spangled Banner" when she performed at the 2011 Super Bowl. But without singing them, try to recite the words of "The Star-Spangled Banner." Most Americans correctly remember the words at the beginning and the end of "The Star-Spangled Banner" but—like Aguilera—have difficulty recalling the words and phrases in the middle. An embarrassed Aguilera later apologized, saying "I got so caught up in the moment of the song that I lost my place" (Chen, 2011). Even seasoned performers are not immune to the serial position effect!

tip-of-the-tongue (TOT) experience A memory phenomenon that involves the sensation of knowing that specific information is stored in long-term memory, but being temporarily unable to retrieve it.

recall A test of long-term memory that involves retrieving information without the aid of retrieval cues; also called *free recall.*

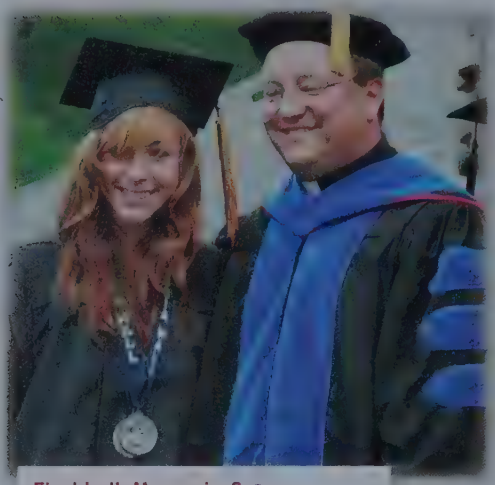
cued recall A test of long-term memory that involves remembering an item of information in response to a retrieval cue.

recognition A test of long-term memory that involves identifying correct information out of several possible choices.

serial position effect The tendency to remember items at the beginning and end of a list better than items in the middle.

encoding specificity principle The principle that when the conditions of information retrieval are similar to the conditions of information encoding, retrieval is more likely to be successful.

context effect The tendency to recover information more easily when the retrieval occurs in the same setting as the original learning of the information.



Courtesy of the authors

Flashbulb Memories? Can you remember where you were when you learned of the death of Michael Jackson? Of Osama bin Laden? Supposedly, shocking national or international events can trigger highly accurate, long-term flashbulb memories. But meaningful personal events, such as your high school graduation or wedding day, are also said to produce vivid flashbulb memories.

A different form of encoding specificity is called **mood congruence**—the idea that a given mood tends to evoke memories that are consistent with that mood. In other words, a specific emotional state can act as a retrieval cue that evokes memories of events involving the same emotion. So, when you're in a positive mood, you're more likely to recall positive memories. When you're feeling blue, you're more likely to recall negative or unpleasant memories.

Flashbulb Memories

Vivid Events, Accurate Memories?

If you rummage around your own memories, you'll quickly discover that highly unusual, surprising, or even bizarre experiences are easier to retrieve from memory than are routine events (Geraci & Manzano, 2010). Such memories are said to be characterized by a high degree of *distinctiveness*. That is, the encoded information represents a unique, different, or unusual memory.

Various events can create vivid, distinctive, and long-lasting memories that are sometimes referred to as *flashbulb memories* (Brown & Kulik, 1982). Just as a camera flash captures the specific details of a scene, a **flashbulb memory** is thought to involve the recall of very specific details or images surrounding a significant, rare, or vivid event.

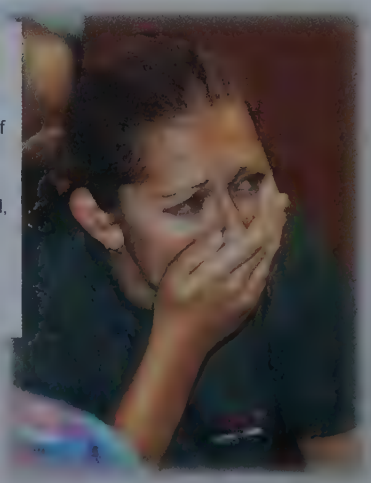
Do flashbulb memories literally capture specific details, like the details of a photograph, that are unaffected by the passage of time? Emotionally charged national events have provided a unique opportunity to study flashbulb memories. On September 12, 2001, psychologists Jennifer Talarico and David Rubin (2003, 2007) had Duke University students complete questionnaires about the terrorist attacks on the United States that had occurred the previous day. The students were asked such questions as: "Where were you when you first heard the news?" "Were there others present, and if so, who?" "What were you doing immediately before you first heard the news?" For comparison, the students also described some ordinary, everyday event that had occurred in their lives at about the same time, such as attending a sporting event or party.

Students were randomly assigned to a follow-up session either 1 week, 6 weeks, or 32 weeks later. At the follow-up sessions, they were asked to describe their memories of the ordinary event as well as their memory of the 9/11 attacks. They were also asked to evaluate the accuracy and vividness of their memories. Then, the researchers compared these accounts to their reports on September 12, 2001. All of the students were tested again in late August 2002—almost a full year after the attacks.

How did the flashbulb memories compare to the ordinary memories? Were the flashbulb memories more likely to be preserved unchanged over time? Not at all. Both the flashbulb and everyday memories gradually decayed over time: The number of consistent details *decreased* and the number of inconsistent details *increased*. However, when the students rated the memory's vividness, their ability to recall the memory, and their belief in the memory's accuracy, only the ratings for the ordinary memory declined. In other words, despite having the same level of inconsistencies as the ordinary memories, the students *perceived* their flashbulb memories of 9/11 as being vivid and accurate.

> Flashbulb memories are not immune to forgetting, nor are they uncommonly consistent over time. Instead, exaggerated belief in memory's accuracy at long delays is what may have led to the conviction that flashbulb memories are more accurate than everyday memories.
>
> *Jennifer Talarico and David Rubin (2003)*

Memories of Traumatic Events If you are like most Americans, you have vivid memories of watching media coverage of the terrorist attacks on September 11, 2001. Although such "flashbulb" memories are emotionally charged, they are not necessarily more accurate than memories of more common events (Talarico & Rubin, 2007, 2009).



AP Photo/The Chapel Hill News, Grant Halverson

Although flashbulb memories can seem incredibly vivid, they appear to function just as normal, everyday memories do (Talarico & Rubin, 2009). We remember some details, forget some details, and think we remember some details. What does seem to distinguish flashbulb memories from ordinary memories is the high degree of confidence the person has in the accuracy of these memories. But clearly, confidence in a memory is *no* guarantee of accuracy. We'll come back to that important point shortly.

Forgetting

When Retrieval Fails

KEY THEME

› Forgetting is the inability to retrieve information that was once available.

KEY QUESTIONS

› What discoveries were made by Hermann Ebbinghaus?

› How do encoding failure, interference, and decay contribute to forgetting, and how can prospective memory be improved?

› What is repression and why is the topic controversial?

Forgetting is so common that life is filled with reminders to safeguard against forgetting important information. Cars are equipped with beeping tones so you don't forget to fasten your seatbelt or turn off your headlights. Dentists thoughtfully send brightly colored postcards and call you the day before your scheduled appointment so that it doesn't slip your mind.

Although forgetting can be annoying, it does have adaptive value. Our minds would be cluttered with mountains of useless information if we remembered the name of every person we'd ever met, or every word of every conversation we'd ever had (Kuhl & others, 2007; Roediger & others, 2010).

Psychologists define **forgetting** as the inability to remember information that was previously available. Note that this definition does not refer to the "loss" or "absence" of once-remembered information. While it's tempting to think of forgetting as simply the gradual loss of information from long-term memory over time, you'll see that this intuitively compelling view of forgetting is much too simplistic. And although psychologists have identified several factors that are involved in forgetting, exactly how—and why—forgetting occurs is still being actively researched (Della Sala, 2010; Wixted, 2004).

mood congruence An encoding specificity phenomenon in which a given mood tends to evoke memories that are consistent with that mood.

flashbulb memory The recall of very specific images or details surrounding a vivid, rare, or significant personal event; details may or may not be accurate.

forgetting The inability to recall information that was previously available.

Hermann Ebbinghaus

The Forgetting Curve

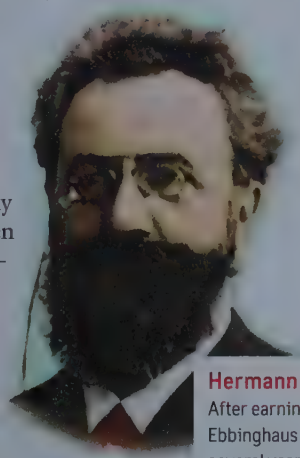
German psychologist **Hermann Ebbinghaus** began the scientific study of forgetting in the 1870s. Because there was a seven-year gap between obtaining his doctorate and his first university teaching position, Ebbinghaus couldn't use university students for experimental subjects (Erdelyi, 2010; Fancher, 1996). So to study forgetting, Ebbinghaus had to rely on the only available research subject: himself.

Ebbinghaus's goal was to determine how much information was forgotten after different lengths of time. But he wanted to make sure that he was studying the memory and forgetting of completely new material, rather than information that had preexisting associations in his memory. To solve this problem, Ebbinghaus (1885) created new material to memorize: thousands of nonsense syllables. A *nonsense syllable* is a three-letter combination, made up of two consonants and a vowel, such as WIB or MEP. It almost sounds like a word, but it is meaningless.

Ebbinghaus carefully noted how many times he had to repeat a list of 13 nonsense syllables before he could recall the list perfectly. To give you a feeling for this task, here's a typical list:

ROH, LEZ, SUW, QOV, XAR, KUF, WEP, BIW, CUL, TIX, QAP, WEJ, ZOD

Once he had learned the nonsense syllables, Ebbinghaus tested his recall of them after varying amounts of time, ranging from 20 minutes to 31 days. He plotted his results in the now-famous Ebbinghaus *forgetting curve*, shown in Figure 6.8 on the next page.



Hermann Ebbinghaus (1850–1909)
After earning his Ph.D. in philosophy in 1873, Ebbinghaus worked as a private tutor for several years. It was during this time that he conducted his famous research on the memory of nonsense syllables. In 1885, he published his results in *Memory: A Contribution to Experimental Psychology*. Ebbinghaus observed, "Left to itself, every mental content gradually loses its capacity for being revived. Facts crammed at examination time soon vanish, if they were not sufficiently grounded by other study and later subjected to a sufficient review." Among his other notable contributions, he developed an early intelligence test, called the *Ebbinghaus Completion Test* (Lander, 1997).

Bettman/Corbis

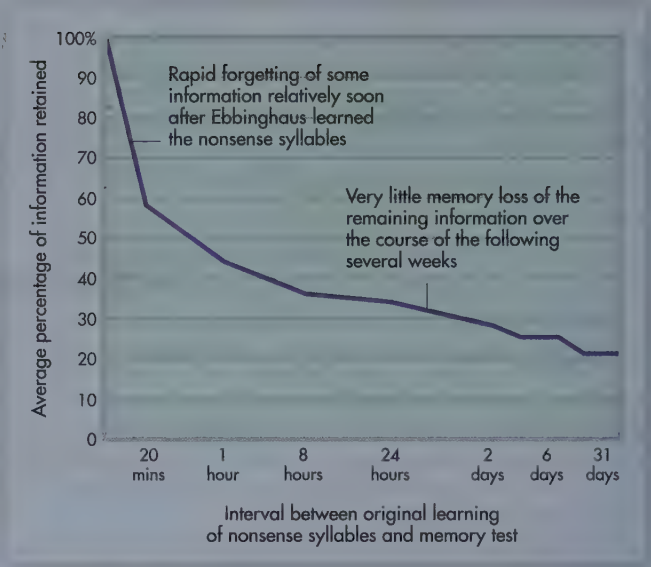


FIGURE 6.8 The Ebbinghaus Forgetting Curve Ebbinghaus's research demonstrated the basic pattern of forgetting: relatively rapid loss of some information, followed by stable memories of the remaining information.

Source: Adapted from Ebbinghaus (1885).

The Ebbinghaus forgetting curve reveals two distinct patterns in the relationship between forgetting and the passage of time. First, much of what we forget is lost relatively soon after we originally learned it. How quickly we forget material depends on several factors, such as how well the material was encoded in the first place, how meaningful the material was, and how often it was rehearsed.

In general, if you learn something in a matter of minutes on just one occasion, most forgetting will occur very soon after the original learning—also in a matter of minutes. However, if you spend many sessions over days or weeks encoding new information into memory, the period of most rapid forgetting will be the first several weeks or months after such learning.

Second, the Ebbinghaus forgetting curve shows that the amount of forgetting eventually levels off. As you can see in Figure 6.8, there's very little difference between how much Ebbinghaus forgot eight hours later and a month later. The information that is *not* quickly forgotten seems to be remarkably stable in memory over long periods of time.

Ebbinghaus's work with nonsense syllables and his forgetting curve have achieved legendary status in psychology. However, it turns out that the pattern of forgetting that Ebbinghaus identified is *not* universal. Under some conditions, memory for new information actually *improves* over time (Erdelyi, 2010; Roediger, 2008).

One well-documented way to increase memory for new information over time is to frequently practice retrieving the information. More specifically, repeatedly *testing* yourself for the new information is a reliable way to improve your memory for that information (Karpicke & Roediger, 2008). One explanation is that retrieving the information on a test reactivates and strengthens the original memory (Hardt & others, 2010). Another possibility is that you learn more effective retrieval cues as you repeatedly test yourself over the same material (Pyc & Rawson, 2010).



Why Do We Forget?

encoding failure The inability to recall specific information because of insufficient encoding of the information for storage in long-term memory.

Ebbinghaus was a pioneer in the study of memory. His major contribution was to identify a basic pattern of forgetting: rapid forgetting of some information relatively soon after the original learning, followed by stability of the memories that remain. But what causes forgetting? Psychologists have identified several factors that contribute to forgetting, including encoding failure, decay, interference, and motivated forgetting.

Encoding Failure

It Never Got to Long-Term Memory

Without rummaging through your loose change, take a look at Figure 6.9. Circle the drawing that accurately depicts the face of a U.S. penny. Now, check your answer against a real penny. Were you correct?

When this task was presented to participants in one study, fewer than half of them picked the correct drawing (Nickerson & Adams, 1982). The explanation? Unless you're a coin collector, you've probably never looked carefully at a penny. Even though you may have handled thousands of pennies, chances are that you've encoded only the most superficial characteristics of a penny—its size, color, and texture—into your long-term memory.

In a follow-up study, William Marmie and Alice Healy (2004) allowed participants to study an unfamiliar coin for short periods of time, ranging from 15 seconds to 60 seconds. Even with only 15 seconds devoted to focusing on the coin's appearance, participants were better able to remember the details of the *unfamiliar* coin than the all-too-familiar penny. In effect, Marmie and Healy (2004) confirmed that lack of attention at the time of encoding was responsible for the failure to accurately remember the appearance of a penny.

As these simple demonstrations illustrate, one of the most common reasons for forgetting is called **encoding failure**—we never encoded the information into long-term memory in the first place. Encoding failure explains why you forget a person's name two minutes after being introduced to her: The information was momentarily present in your short-term memory, but was never encoded into long-term memory.

Encoding failure can also help explain everyday memory failures due to *absent-mindedness*. Absentmindedness occurs because you don't pay enough attention to a bit of information at the time when you should be encoding it, such as in which aisle you parked your car at the airport. Absentminded memory failures often occur because your attention is *divided*. Rather than focusing your full attention on what you're doing, you're also thinking about other matters (McVay & Kane, 2010).

Research has shown that divided attention at the time of encoding tends to result in poor memory for the information (Riby & others, 2008; Smallwood & others, 2007; Craik & others, 1996). Such absentminded memory lapses are especially common when you're performing habitual actions that don't require much thought, such as parking your car in a familiar parking lot or setting down your cell phone, keys, and wallet or purse when you come home. In some situations, divided attention might even contribute to déjà vu experiences, as we discuss in the In Focus box on the next page.

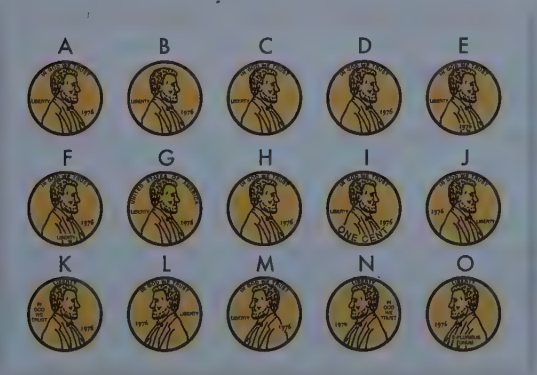


FIGURE 6.9 Test for Memory of Details of a Common Object Which of these drawings is an accurate picture of a real penny?

IN FOCUS

Déjà Vu Experiences: An Illusion of Memory?

The term *déjà vu* is French for "already seen." A **déjà vu experience** involves brief but intense feelings of familiarity in a situation that has not been previously experienced. Or, in some instances, you have this intense, even eerie, feeling of having experienced the exact situation before as it is happening to you but you're not able to recall precisely when or where. Psychology's interest in déjà vu extends back to the late 1800s when the famous American psychologist William James (1890, 1902) wrote about these experiences.

Déjà Vu Characteristics

Déjà vu experiences are common. Psychologist Alan Brown (2004) analyzed the results of more than 30 surveys and found that about two-thirds of individuals (68 percent) reported having had one or more déjà vu experiences in their life. He also found that the incidence of déjà vu experiences changes over the lifespan. Young adults in the 20–24 age range tend to have the most frequent occurrences, averaging three déjà vu experiences per year. For about 1 out of 6 people (16 percent), déjà vu experiences happen about once a month. But by the time people reach the threshold of middle adulthood in their early 40s, déjà vu experiences have dwindled to less than one per year.

Although typically triggered by a visual scene, déjà vu experiences can involve all of the senses. For example, blind people can also experience déjà vu (O'Connor & Moulin, 2006). The experiences are most common when people are feeling fatigued or emotionally distressed. They usually occur in the evening hours and in the company of other people. Interestingly, there is a higher incidence of déjà vu experiences in people who are well-educated, travel frequently, often watch movies, and regularly remember their dreams (Brown, 2003; Cleary, 2008). We'll come back to that last point shortly.

Because déjà vu experiences are often described as being a weird sensation, some people immediately assume that the experience must have been an instance of clairvoyance, telepathy, or some other paranormal experience. But rather than paranormal explanations, contemporary psychologists believe that déjà vu can provide insights into basic memory processes (see Cleary, 2008; Cleary & Specker, 2007).

Explaining Déjà Vu

The déjà vu experience typically involves the brief, intense, and eerie feeling of familiarity in a situation you're certain you've *never* experienced before. For example, let's suppose that you have an intense déjà vu experience as you arrive to stand in line to enter Chicago's Shedd Aquarium. You *know* you've never visited the Shedd Aquarium before, so there is *no* memory source you can identify for the intense feeling of recognition.

Psychologist Anne Cleary (2008) believes this sense of familiarity suddenly arises when enough features in the current situation trigger the sensation of matching features already contained in a previous memory. But even though you intuitively sense and recognize the memory as familiar, you can't pinpoint a *source* for that familiarity. This is what memory researchers refer to as a disruption in **source memory** or **source monitoring**—your ability to remember the original details or features of a memory, including when, where, and how you acquired the information or had the experience.

Most likely, your déjà vu experience was due to *source amnesia:* You have *indirectly* experienced this scene or situation before but you've forgotten the memory's source. And what might that indirect but forgotten memory source be? Earlier we noted that people who are well-educated, travel a lot, often watch movies, and remember their dreams are more prone to déjà vu experiences (see Brown, 2004; Cleary, 2008). Any one of those factors is a potential gold mine of memory retrieval clue fragments that can match elements of the current scene, triggering a sense of familiarity. Other sources might be magazine photos, Web sites, or travel brochures. Of course, had you immediately recalled the previous source from a little over two years ago—a Discovery Channel show you watched that featured lots of scenes at Chicago's Shedd Aquarium—you probably wouldn't have had a déjà vu experience.

Another memory explanation for déjà vu involves a form of *encoding failure* called *inattentional blindness,* which we discussed in Chapter 4. According to the inattentional blindness explanation, déjà vu can be produced when you're not really paying attention to your surroundings (Brown, 2005; Brown & Marsh, 2010). So, suppose you're oblivious (or blind) to your surroundings while chatting on your cell phone as you wait in line to enter the Shedd Aquarium. As the call ends and you're still thinking about the conversation, you glance up at the entrance to the Shedd Aquarium and bang! *A déjà vu experience!*

In this case, the feeling that you have been there before is due to the fact that you really *have* been there before—a split second ago. While talking on your cell phone, you were nonconsciously processing information about your surroundings. But when you ended the call, and, a split second later, you shifted your attention, your surroundings were suddenly—and inexplicably—consciously perceived as familiar.

A different possible explanation comes from the brain itself. Neurological evidence suggests that at least some instances of déjà vu are related to brain dysfunction. In particular, it has long been known that déjà vu experiences can be triggered by temporal lobe disruptions (see Milner, 1954; Guedj & others, 2010). For many people with epilepsy, the seizures often originate in the temporal lobe. In these people, a déjà vu experience sometimes occurs just prior to a seizure (Lytton, 2008).

For most people, however, déjà vu experiences probably involve the common memory processes of *source amnesia* and *inattentional blindness.* To learn about other scientific explanations for déjà vu, check out Alan Brown's (2004) scholarly compilation of the research in his book *The Déjà Vu Experience.*

Absentmindedness is also implicated in another annoying memory problem—forgetting to do something in the future, such as returning a library book or taking a medication on schedule. Remembering to do something in the future is called **prospective memory.** In contrast to other types of memories, the crucial component of a prospective memory is *when* something needs to be remembered, rather than *what.*

Rather than encoding failure, prospective memory failures are due to *retrieval cue failure*—the inability to recall a memory because of missing or inadequate retrieval cues. For example, you forget to mail your credit card payment on time and incur a late fee. The problem with this sort of scenario is that there is no strong, distinctive retrieval cue embedded in the situation. This is why ovens are equipped with timers that buzz and why your authors' kitchen calendar looks like a multicolored Post-it notes decoupage. Such strategies provide distinctive retrieval cues that will hopefully trigger those prospective memories at the appropriate moment. Table 6.1 lists additional suggestions to help minimize prospective memory failures.

TABLE 6.1

Eight Suggestions for Avoiding Prospective Memory Failure

1. Be proactive! Create a reminder the instant you realize that you need to do something in the future.
2. Make reminder cues DISTINCTIVE and make sure that they tell you *what* you are supposed to remember to do.
3. Make reminder cues **obvious** by posting them where you will definitely see them, such as on your mirror, front or back door, rearview car mirror, computer monitor, and so on.
4. Put a notepad or Post-it notes and a pencil in lots of convenient places (e.g., your dresser, your car, the kitchen counter, etc.).
5. For things you need to remember to do in the next few hours, buy small battery-operated kitchen timers. (Yes, it's true. We have seven timers scattered throughout our home offices.)
6. Leave yourself a voicemail message with the reminder at home or at work.
7. Use the calendar reminder and follow-up features on your computer or use a free Internet reminder service (e.g., www.memotome.com).
8. iPhone fans, check out reminder apps. Mac people, check out reminder widgets. PC people, download free reminder software, such as the classic 3M Post-it Notes Lite software.

Decay Theory

Fading with the Passage of Time

According to **decay theory,** we forget memories because we don't use them and they fade away over time as a matter of normal brain processes. The idea is that when a new memory is formed, it creates a *memory trace*—a distinct structural or chemical change in the brain. Over time, the normal metabolic processes of the brain are thought to erode the memory trace, especially if it is not "refreshed" by frequent rehearsal. The gradual fading of memories, then, would be similar to the fading of letters on billboards or newsprint exposed to environmental elements, such as sunlight.

Although decay theory makes sense intuitively, too much evidence contradicts it (Jonides & others, 2008). Look again at the Ebbinghaus forgetting curve on page 248. If memories simply faded over time, you would expect to see a steady decline in the amount of information remembered with the passage of time. Instead, once the information held in memory stabilizes, it changes very little over time. In other words, the *rate* of forgetting actually *decreases* over time (Wixted, 2004).

Beyond that point, many studies have shown that information can be remembered decades after it was originally learned, even though it has not been rehearsed or recalled since the original memory was formed (Custers & Ten Cate, 2011). As we discussed earlier, the ability to access memories is strongly influenced by the kinds of retrieval cues provided when memory is tested. If the memory trace simply decayed over time, the presentation of potent retrieval cues should have no effect on the retrieval of information or events experienced long ago—but it does!

So have contemporary memory researchers abandoned decay theory as an explanation of forgetting? Not completely. Although decay is not regarded as the primary cause of forgetting, many of today's memory researchers believe that it contributes to forgetting (Altmann, 2009; Portrat & others, 2008).

Interference Theory

Memories Interfering with Memories

According to the **interference theory** of forgetting, forgetting is caused by one memory competing with or replacing another memory. The most critical factor is the similarity of the information. The more similar the information is in two memories, the more likely it is that interference will be produced.

There are two basic types of interference. **Retroactive interference** is backward-acting memory interference. It occurs when a *new* memory (the combination for the new lock you just bought for your bicycle) interferes with remembering an *old* memory (the combination for the lock you've been using at the gym).

Proactive interference is forward-acting memory interference. It occurs when an *old* memory (your previous zip code) interferes with remembering a *new* memory (your new zip code). A rather embarrassing example of proactive interference occurs when someone uses the name of his previous partner in referring to a current partner. Such spontaneous memory glitches can occur in the rapid-fire verbal exchange of a heated argument or in the thralls of passion (hopefully not both).

- **déjà vu experience** A memory illusion characterized by brief but intense feelings of familiarity in a situation that has never been experienced before.
- **source memory** or **source monitoring** Memory for when, where, and how a particular experience or piece of information was acquired.
- **prospective memory** Remembering to do something in the future.
- **decay theory** The view that forgetting is due to normal metabolic processes that occur in the brain over time.
- **interference theory** The theory that forgetting is caused by one memory competing with or replacing another.
- **retroactive interference** Forgetting in which a new memory interferes with remembering an old memory; backward-acting memory interference.
- **proactive interference** Forgetting in which an old memory interferes with remembering a new memory; forward-acting memory interference.

suppression Motivated forgetting that occurs consciously; a deliberate attempt to not think about and remember specific information.

repression Motivated forgetting that occurs unconsciously; a memory that is blocked and unavailable to consciousness.

Motivated Forgetting

Forgetting Unpleasant Memories

Motivated forgetting refers to the idea that we forget because we are motivated to forget, usually because a memory is unpleasant or disturbing. One form of motivated forgetting, called **suppression,** involves the deliberate, conscious effort to forget information. For example, after seeing a disturbing report of a horrendous crime or massacre on the evening news, you consciously avoid thinking about it, turning your attention to other matters. According to some researchers, over time and with repeated effort, pushing an unwanted memory out of awareness may make the memory less accessible (M.C. Anderson & Levy, 2009; Meier & others, 2011).

Another form of motivated forgetting is fundamentally different and much more controversial. **Repression** can be defined as motivated forgetting that occurs unconsciously (Langnickel & Markowitsch, 2006). With repression, all memory of a distressing event or experience is blocked from conscious awareness.

As we'll discuss in greater detail in Chapters 11 (Personality) and 15 (Therapies), the idea of repression is a cornerstone of *psychoanalysis,* Sigmund Freud's famous theory of personality and psychotherapy (Knafo, 2009). Freud (1904) believed that psychologically threatening emotions, feelings, conflicts, and urges, especially those that originated in early childhood, become repressed. Even though they are blocked and unavailable to consciousness, the repressed conflicts continue to unconsciously influence the person's behavior, thoughts, and personality, often in maladaptive or unhealthy ways.

Among clinical psychologists who work with psychologically troubled people, the notion that behavior can be influenced by repressed memories is widely, but certainly not universally, accepted (Gleaves & others, 2004). Among the general public, many people believe that we are capable of repressing memories of unpleasant events. However, trying to scientifically confirm and study the influence of memories that a person does not remember is tricky, if not impossible.

One obvious problem is determining whether a memory has been "repressed" or simply forgotten. For example, several studies have found that people are better able to remember positive life experiences than negative life experiences (Lambert & others, 2010). Is that because unhappy experiences have been "repressed"? Or is it simply that people are less likely to think about, talk about, dwell on, or rehearse unhappy memories?

Among psychologists, repression is an extremely controversial topic (see Erdelyi, 2006a, b). At one extreme are those who believe that true repression *never* occurs (Hayne & others, 2006). At the other extreme are those who are convinced that repressed memories are at the root of many psychological problems, particularly repressed memories of childhood sexual abuse (Gleaves & others, 2004). This latter contention gave rise to a form of psychotherapy involving the recovery of repressed memories. Later in the chapter, we'll explore this controversy in the Critical Thinking box, "The Memory Wars: Recovered or False Memories?"



AP Photo/The Ledger–Independent, Tammie Brown

Motivated Forgetting Car accidents, serious illnesses, surgeries, and other traumatic events are painful to relive in memory. Some researchers believe that by voluntarily directing our attention away from memories of such traumatic events, we can eventually *suppress* our memory of the experiences, making them difficult or impossible to consciously retrieve (Anderson & others, 2011).

Imperfect Memories

Errors, Distortions, and False Memories

KEY THEME

› Memories can be easily distorted so that they contain inaccuracies. Confidence in a memory is no guarantee that the memory is accurate.

KEY QUESTIONS

› What is the misinformation effect?

› What is source confusion, and how can it distort memories?

› What are schemas and scripts, and how can they contribute to memory distortions?

Although people usually remember the general gist of what they experience, the fallibility of human memory is disturbing. Human memory does *not* function like a camera or digital recorder that captures a perfect copy of visual or auditory information. Instead, memory details can change over time. Without your awareness, details can be added, subtracted, exaggerated, or downplayed (Clifasefi & others, 2007). In fact, each of us has the potential to confidently and vividly remember the details of some event—and be completely *wrong*. Confidence in a memory is no guarantee that the memory is accurate.

How do errors and distortions creep into memories? A new memory is not simply recorded, but *actively constructed*. To form a new memory, you actively organize and encode different types of information—visual, auditory, tactile, and so on. When you later attempt to retrieve those details, you actively *reconstruct*, or rebuild, the details of the memory (Bartlett, 1932; Stark & others, 2010). In the process of actively constructing or reconstructing a memory, various factors can contribute to errors and distortions in what you remember. Or, more accurately, what you *think* you remember.

At the forefront of research on memory distortions is **Elizabeth Loftus,** whose story we told in the Prologue. Loftus is one of the most widely recognized authorities on eyewitness memory and the different ways it can go awry. She has not only conducted extensive research on this topic, but also testified as an expert witness in many high-profile cases (see Loftus, 2011, 2007).



Courtesy Elizabeth Loftus

Psychological studies have shown that it is virtually impossible to tell the difference between a real memory and one that is a product of imagination or some other process. Our job as researchers in this area is to understand how it is that pieces of experience are combined to produce what we experience as "memory."

Elizabeth Loftus (2002)

The Misinformation Effect

The Influence of Post-Event Information on Misremembering

Let's start by considering a Loftus study that has become a classic piece of research. Loftus and co-researcher John C. Palmer (1974) had subjects watch a film of an automobile accident, write a description of what they saw, and then answer a series of questions. There was one critical question in the series: "About how fast were the cars going when they contacted each other?" Different subjects were given different versions of that question. For some subjects, the word *contacted* was replaced with *hit*. Other subjects were given the words *bumped, collided,* or *smashed*.

Depending on the specific word used in the question, subjects gave very different speed estimates. As shown in Table 6.2, the subjects who gave the highest speed estimates got *smashed* (so to speak). Clearly, how a question is worded can influence what is remembered.

A week after seeing the film, the subjects were asked another series of questions. This time, the critical question was "Did you see any broken glass?" Although *no* broken glass was shown in the film, the majority of the subjects whose question had used the word *smashed* a week earlier said "yes." Notice what happened: Following the initial memory (the film of the automobile accident), new information (the word *smashed*) distorted the reconstruction of the memory (remembering broken glass that wasn't really there).

TABLE 6.2

Estimated Speeds

Word Used in Question	Average Speed Estimate
smashed	41 m.p.h.
collided	39 m.p.h.
bumped	38 m.p.h.
hit	34 m.p.h.
contacted	32 m.p.h.

Source: After Loftus & Palmer (1974).

The Misinformation Effect in Action In October 2002, the Washington, D.C., area was terrorized by a series of random sniper attacks. Early on, the police issued an alert that an eyewitness reported a white van speeding from the scene of a shooting. Later attacks brought more eyewitness reports of a white van or truck. Hundreds of white vans were pulled over and searched by the police. In reality, the killers, John Allen Muhammad and Lee Boyd Malvo, were traveling in a dark blue Chevrolet Caprice. Ironically, several people had reported seeing a blue Caprice near different shooting scenes, but these reports were largely ignored because of the misinformed fixation on a white van.



Reuters/Corbis

The use of suggestive questions is but one example of how the information a person gets *after* an event can change what the person later remembers about the event. Literally hundreds of studies have demonstrated the different ways that the **misinformation effect** can be produced (Loftus, 1996, 2005). Basically, the research procedure involves three steps. First, participants are exposed to a simulated event, such as an automobile accident or a crime. Next, after a delay, half of the participants receive misinformation, while the other half receive no misinformation. In the final step, all of the participants try to remember the details of the original event.

In study after study, Loftus as well as other researchers have confirmed that post-event exposure to misinformation can distort the recollection of the original event by eyewitnesses (see Frenda & others, 2011; Davis & Loftus, 2007). People have recalled stop signs as yield signs, normal headlights as broken, barns along empty country roads, a blue vehicle as being white, and Minnie Mouse when they really saw Mickey Mouse! Whether it is in the form of suggestive questions, misinformation, or other exposure to conflicting details, such post-event experiences can distort eyewitness memories (Brewer & Wells, 2011).

Eyewitness Misidentification: Convicting the Wrong Man Four months after being attacked, kidnapped, and raped, an Oklahoma woman picked Arvin McGee out of a photographic lineup and identified him as the attacker. She claimed he had tied her up and carried her over his shoulders to a car. Then, she said, he drove her to a secluded area where he raped her. Based solely on the victim's eyewitness identification, McGee was arrested for the brutal crime. His first trial was declared a mistrial. His second ended in a hung jury. His third trial resulted in a guilty verdict. Despite the fact that McGee had an alibi and was also suffering from an abdominal hernia that would have made it virtually impossible for him to commit the crime, he was convicted and sentenced to 365 years in jail. Thirteen years after his conviction, DNA testing finally proved what McGee had maintained throughout his trials and years in prison—that he was innocent of the crime. Scores of studies have shown that eyewitness *mis*identification is the leading cause of wrongful convictions (see Garrett, 2008; Gross & others, 2005; Wells & Loftus, 2003).



Kelly Kerr/Tulsa World

Source Confusion

Misremembering the Source of a Memory

Have you ever confidently remembered hearing something on television only to discover that it was really a friend who told you the information? Or mistakenly remembered doing something that you actually only *imagined* doing? Or confidently remembered that an event happened at one time and place only to learn later that it really happened at a *different* time and place?

If so, you can blame your faulty memories on a phenomenon called source confusion. **Source confusion** arises when the true source of the memory is forgotten or when a memory is attributed to the wrong source (Johnson & others, in press; Lindsay, 2008). The notion of source confusion can help explain the misinformation effect: False details provided *after* the event become confused with the details of the original memory. For example, in one classic study, participants viewed images showing the use of a screwdriver in a burglary (Loftus & others, 1989). Later, they read a written account of the break-in, but this account featured a hammer instead of a screwdriver. When tested for their memory of the images, 60 percent said that a hammer (the post-event information), rather than a screwdriver (the original information), had been used



Stuart Franklin/Magnum Photos



Stuart Franklin/Magnum Photos and courtesy of Elizabeth Loftus and Dario Sacchi

Which Is the Real Photo?
The photograph of an unknown young man bravely defying oncoming tanks in an anti-government protest in China's Tiananmen Square has become an iconic image of individual courage and the global struggle for human rights. But after people who remembered the original image correctly were shown the doctored image on the right, their memories changed to incorporate the crowds of onlookers in the fake photo (Sacchi & others, 2007).

in the burglary. And they were just as confident of their *false* memories as they were when recalling their *accurate* memories of other details of the original event.

More recently, photographs have been used to demonstrate how false details presented after an original event can become confused with the authentic details of the original memory (Henkel, 2011; Strange & others, 2011). For example, shown digitally doctored photos of famous news events, such as the violent 1989 Tiananmen Square protests in Beijing, China, details from the *fake* photos were incorporated into participants' memories of the actual news event (Sacchi & others, 2007).

Elizabeth's story in the Prologue also demonstrated how confusion about the source of a memory can give rise to an extremely vivid, but inaccurate, recollection. Vivid and accurate memories of her uncle's home, such as the smell of the pine trees and the feel of the lake water, became blended with Elizabeth's fantasy of finding her mother's body. The result was a **false memory,** which is a distorted or fabricated recollection of something that did not actually happen. Nonetheless, the false memory subjectively feels authentic and is often accompanied by all the emotional impact of a real memory.

In essence, all memory is false to some degree. Memory is inherently a reconstructive process, whereby we piece together the past to form a coherent narrative that becomes our autobiography. In the process of reconstructing the past, we color and shape our life's experiences based on what we know about the world.

Daniel M. Bernstein & Elizabeth F. Loftus, 2009

Schemas, Scripts, and Memory Distortions

The Influence of Existing Knowledge on What Is Remembered

Given that information presented after a memory is formed can change the contents of that memory, let's consider the opposite effect: Can the knowledge you had *before* an event occurred influence your later memory of the event? If so, how?

Since you were a child, you have been actively forming mental representations called **schemas**—organized clusters of knowledge and information about particular topics. The topic can be almost anything—an object (e.g., a wind chime), a setting (e.g., a movie theater), or a concept (e.g., freedom). One kind of schema, called a **script,** involves the typical sequence of actions and behaviors at a common event, such as eating in a restaurant or taking a plane trip.

Schemas are useful in organizing and forming new memories. Using the schemas you already have stored in long-term memory allows you to quickly integrate new experiences into your knowledge base. For example, consider your schema for "phone." No longer just a utilitarian communication device, phones can be used to play games, flirt, or make a fashion statement. As the capabilities and functions of phones have expanded, your schema has changed to incorporate these new attributes. Your schema for "phone" includes cordless, wireless, and cellular phones, including devices that can transmit photos and text messages. So now, when you hear about a new cell phone that can handle your e-mail, cruise the Internet, act as an onboard GPS unit, and that has hundreds of other applications, you can quickly integrate that information into your existing schema for "phone."

- **misinformation effect** A memory-distortion phenomenon in which a person's existing memories can be altered if the person is exposed to misleading information.
- **source confusion** A memory distortion that occurs when the true source of the memory is forgotten.
- **false memory** A distorted or fabricated recollection of something that did not actually occur.
- **schema** (SKEE-muh) An organized cluster of information about a particular topic.
- **script** A schema for the typical sequence of an everyday event.



Brewer, W.F., and Treyens, J.C. (1981). "Role of Schemata in memory for place." *Cognitive Psychology*, 23, Figure 1, pp. 207-230.

False Memories of a Psychology Professor's Office After briefly waiting in the psychology professor's office shown below, participants were taken to another room and asked to recall details of the office—the real purpose of the study. Many participants falsely remembered objects that were not actually in the office, such as books, a filing cabinet, a telephone, a lamp, pens, pencils, and a coffee cup. Why? The details that the participants erroneously remembered were all items that would be consistent with a typical professor's office (Brewer & Treyens, 1981). Schemas can cause memory errors by prompting us to fill in missing details with schema-consistent information (Kleider & others, 2008).

Although useful, schemas can also contribute to memory distortions. In the classic "psychology professor's office" study described in the photo caption on the left, students erroneously remembered objects that were not actually present but were consistent with their schema of a professor's office (Brewer & Treyens, 1981). The schemas we have developed can promote memory errors by prompting us to fill in missing details with schema-consistent information.

But what if a situation contains elements that are *inconsistent* with our schemas or scripts for that situation? Are inconsistent items more likely to stand out in our minds and be better remembered? In a word, yes. Numerous studies have demonstrated that items that are inconsistent with our expectations tend to be better recalled and recognized than items that are consistent with our expectations (e.g., Kleider & others, 2008; Lampinen & others, 2001).

For example, University of Arkansas psychologist James Lampinen and his colleagues (2000) had participants listen to a story about a guy named Jack who performed some everyday activities, like washing his car and taking his dog to the veterinarian for shots. In each scene, Jack performed some actions that would have been consistent with the script (e.g., filling a bucket with soapy water, filling out forms at the vet's office) and some behaviors that were *not* part of a typical script for the activity (e.g., spraying the neighbor's kid with the hose, flirting with the vet's receptionist). When tested for details of the story, participants were more likely to recognize and remember the atypical actions than the consistent actions.

Much like the subjects in the professor's office study, participants in Lampinen's study also experienced compelling *false memories*. Almost always, the false memories were for actions that would have been consistent with the script—if they had actually happened in the story. For example, some participants vividly remembered that Jack rinsed the car off with a hose or that he put a leash on the dog before taking him to the vet's office. Neither of those actions occurred in the story.

Forming False Memories

From the Plausible to the Impossible

KEY THEME

› A variety of techniques can create false memories for events that never happened.

KEY QUESTIONS

› What is the *lost-in-the-mall* technique, and how does it produce false memories?

› What is imagination inflation, and how has it been demonstrated?

› What factors contribute to the formation of false memories?

Up to this point, we've talked about how misinformation, source confusion, and the mental schemas and scripts we've developed can change or add details to a memory that already exists. However, memory researchers have gone beyond changing a few details here and there. Since the mid-1990s, an impressive body of

research has accumulated showing how false memories can be created for events that *never* happened (Frenda & others, 2011; Loftus & Cahill, 2007). We'll begin with another Loftus study that has become famous—the *lost-in-the-mall* study.

Imagination Inflation

Remembering Being Lost in the Mall

Loftus and Jacqueline Pickrell (1995) gave each of 24 participants written descriptions of four childhood events that had been provided by a parent or other older relative. Three of the events had really happened, but the fourth was a *pseudoevent*—a false story about the participant getting lost in a shopping mall. Here's the gist of the story: At about the age of 5 or 6, the person got lost for an extended period of time in a shopping mall, became very upset and cried, was rescued by an elderly person, and ultimately was reunited with the family. (Family members verified that the participant had never actually been lost in a shopping mall or department store as a child.)

After reading the four event descriptions, the participants wrote down as many details as they could remember about each event. About two weeks later, participants were interviewed and asked to recall as many details as they could about each of the four events. Approximately one to two weeks after that, participants were interviewed a second time and asked once again what they could remember about the four events.

By the final interview, 6 of the 24 participants had created either full or partial memories of being lost in the shopping mall. How entrenched were the false memories for those who experienced them? Even after being debriefed at the end of the study, some of the participants continued to struggle with the vividness of the false memory. "I totally remember walking around in those dressing rooms and my mom not being in the section she said she'd be in," one participant said (Loftus & Pickrell, 1995).

The research strategy of using information from family members to help create or induce false memories of childhood experiences has been dubbed the *lost-in-the-mall technique* (Loftus, 2003). By having participants remember real events along with imagining pseudoevents, researchers have created false memories for a wide variety of events. For example, participants have been led to believe that as a child they had been saved by a lifeguard from nearly drowning (Heaps & Nash, 2001). Or that they had knocked over a punch bowl on the bride's parents at a wedding reception (Hyman & Pentland, 1996).

Clearly, then, research has demonstrated that people can develop beliefs and memories for events that definitely did not happen to them. One key factor in the



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"And here I am at two years of age. Remember? Mom? Pop? No? Or how about this one. My first day of school. Anyone?"



Michael Newman / Photo Edit

Can Real Photos Create False Memories?

Psychologist Stephen Lindsay and his colleagues (2004a, 2004b) had participants look at their first-grade class photo and read a description of a prank that they were led to believe had occurred in the first grade—putting slime in their teacher's desk. After a week of trying to remember the prank, 65 percent of the participants reported vivid, detailed memories of the prank. In contrast, only about a quarter (23 percent) of participants who tried to remember the prank but did *not* view a school photo developed false memories of the pseudoevent. Viewing an actual school photo, Lindsay believes, added to the legitimacy of the pseudoevent, making it seem more probable. It also provided vivid sensory details that blended with the imagined details to create elaborate and subjectively compelling false memories. Real photos can lend credibility to imaginary events (Strange & others, 2011).

imagination inflation A memory phenomenon in which vividly imagining an event markedly increases confidence that the event actually occurred.

creation of false memories is the power of imagination. Put simply, *imagining the past as different from what it was can change the way you remember it.* Several studies have shown that vividly imagining an event markedly increases confidence that the event actually occurred in childhood, an effect called **imagination inflation** (Garry & Polaschek, 2000; Thomas & others, 2003).

How does imagining an event—even one that never took place—help create a memory that is so subjectively compelling? Several factors seem to be involved. First, repeatedly imagining an event makes the event seem increasingly *familiar.* People then misinterpret the sense of familiarity as an indication that the event really happened (Sharman & others, 2004).

Second, coupled with the sense of increased familiarity, people experience *source confusion.* That is, subtle confusion can occur as to whether a retrieved "memory" has a real event—or an imagined event—as its source. Over time people may misattribute their memory of *imagining* the pseudoevent as being a memory of the *actual* event.

Third, the more vivid and detailed the imaginative experience, the more likely it is that people will confuse the imagined event with a real occurrence (Thomas & others, 2003). Vivid sensory and perceptual details can make the imagined events feel more like real events.

Simple manipulations, such as suggestions and imagination exercises, can increase the incidence and realism of false memories. So can vivid memory cues and family photos. Table 6.3 summarizes factors known to contribute to the formation of false memories.

The ease with which false memories can be implanted is more than just an academic question. It also has some powerful real-world implications. In the Critical Thinking box, we explore the highly charged controversy that has been dubbed "the memory wars."

Finally, we don't want to leave you with the impression that it's astonishing that anybody remembers *anything* accurately. In reality, people's memories tend to be quite accurate for the gist of what occurred. When memory distortions occur spontaneously in everyday life, they usually involve limited bits of information.

Still, the surprising ease with which memory details can become distorted is unnerving. Distorted memories can ring true and feel just as real as accurate memories (Bernstein & Loftus, 2009; Clifasefi & others, 2007). In the chapter Prologue, you saw how easily Elizabeth Loftus created a false memory. You also saw how quickly she became convinced of the false memory's authenticity and the strong emotional impact it had on her. Rather than being set in stone, human memories are more like clay: They can change shape with just a little bit of pressure.

TABLE 6.3

Factors Contributing to False Memories

Factor	Description
Misinformation effect	When erroneous information received after an event leads to distorted or false memories of the event
Source confusion	Forgetting or misremembering the true source of a memory
Schema distortion	False or distorted memories caused by the tendency to fill in missing memory details with information that is consistent with existing knowledge about a topic
Imagination inflation	Unfounded confidence in a false or distorted memory caused by vividly imagining the pseudoevent
False familiarity	Increased feelings of familiarity due to repeatedly imagining an event
Blending fact and fiction	Using vivid, authentic details to add to the legitimacy and believability of a pseudoevent
Suggestion	Hypnosis, guided imagery, or other highly suggestive techniques that can inadvertently or intentionally create vivid false memories

CRITICAL THINKING

The Memory Wars: Recovered or False Memories?

Repressed memory therapy, recovery therapy, recovered memory therapy, trauma therapy—these are some of the names of a therapy introduced in the 1990s and embraced by many psychotherapists, counselors, social workers, and other mental health workers. Proponents of the therapy claimed they had identified the root cause of a wide assortment of psychological problems: repressed memories of sexual abuse that had occurred during childhood.

This therapeutic approach assumed that incidents of sexual and physical abuse experienced in childhood, especially when perpetrated by a trusted caregiver, were so psychologically threatening that the victims repressed all memories of the experience (Gleaves & others, 2004; McNally & Geraerts, 2009). Despite being repressed, these unconscious memories of unspeakable traumas continued to cause psychological and physical problems, ranging from low self-esteem to eating disorders, substance abuse, and depression.

The goal of repressed memory therapy was to help adult incest survivors "recover" their repressed memories of childhood sexual abuse. Reliving these painful experiences would help them begin "the healing process" of working through their anger and other intense emotions (Bass & Davis, 1994). Survivors were encouraged to confront their abusers and, if necessary, break all ties with their abusive families.

The Controversy: The "Recovery" Methods

The validity of the memories recovered in therapy became the center of a highly charged public controversy that has been dubbed "the memory wars" (Loftus, 2004; Mazzoni & Scoboria, 2007). A key issue was the methods used to help people unblock, or recover, repressed memories. Some recovered memory therapists used hypnosis, dream analysis, guided imagery, intensive group therapy, and other highly suggestive techniques to recover the long-repressed memories (Thayer & Lynn, 2006).

Many patients supposedly recovered memories of repeated incidents of physical and sexual abuse, sometimes beginning in early infancy, ongoing for years, and involving multiple victimizers. Even more disturbing, some patients recovered vivid memories of years of alleged ritual satanic abuse involving secret cults practicing cannibalism, torture, and ritual murder (Loftus & Davis, 2006; Sakheim & Devine, 1992).

The Critical Issue: Recovered or False Memories?

Are traumatic memories likely to be repressed? It is well established that in documented cases of trauma, most survivors are troubled by the *opposite* problem—they cannot forget their traumatic memories (Kihlstrom, 2004; McNally & Geraerts, 2009). Rather than being unable to remember the experience, trauma survivors suffer from recurring flashbacks, intrusive thoughts and memories of the trauma, and nightmares. This pattern is a key symptom of post-traumatic stress disorder (PTSD), which we'll discuss in Chapter 13.

> In more than twenty-five years of doing several hundred studies involving perhaps 20,000 people, we had distorted a significant portion of the subjects' memories. And the mechanism by which we can convince people they were lost, frightened, and crying in a mall is not so different than the mechanism by which therapists might unwittingly encourage memories of sexual abuse.
>
> *Elizabeth Loftus (2003)*

While it is relatively common for a person to be unable to remember *some* of the specific details of a traumatic event or to be troubled by memory problems after the traumatic event, such memory problems do *not* typically include difficulty in remembering the trauma itself (McNally, 2007). Memory researchers agree that a person might experience amnesia for a single traumatic incident but are skeptical that anyone could repress *all* memories of *repeated* incidents of abuse, especially when those incidents occurred over a period of several years (McNally & Geraerts, 2009).

Critics of repressed memory therapy contend that many of the supposedly "recovered" memories are actually *false memories* that were produced by the well-intentioned but misguided use of suggestive therapeutic techniques (Davis & Loftus, 2009). Memory experts object to the use of hypnosis and other highly suggestive techniques to recover repressed memories (Gerrie & others, 2004; McNally & Geraerts, 2009). Understandably so. As you've seen in this chapter, compelling research shows the ease with which misinformation, suggestion, and imagination can create vivid—but completely *false*—memories.

What Conclusions Can Be Drawn?

After years of debate, some areas of consensus have emerged (Allen, 2005; Colangelo, 2007). First, there is no question that physical and sexual abuse in childhood is a serious social problem that also contributes to psychological problems in adulthood (Hillberg & others, 2011).

Second, some psychologists contend it is *possible* for memories of childhood abuse to be completely forgotten, only to surface many years later in adulthood (Colangelo, 2007). Nevertheless, it's clear that repressed memories that have been recovered in psychotherapy need to be regarded with caution (Piper & others, 2008).

Third, the details of memories can be distorted with disturbing ease. Consequently, the use of highly suggestive techniques to recover memories of abuse raises serious concerns about the accuracy of such memories. As we have noted repeatedly in this chapter, a person's confidence in a memory is no guarantee that the memory is indeed accurate. False or fabricated memories can seem just as detailed, vivid, and real as accurate ones (Gerrie & others, 2004; Lampinen & others, 2005).

Fourth, keep in mind that every act of remembering involves reconstructing a memory. Remembering an experience is not like replaying a movie captured with your cell phone. Memories can change over time. Without our awareness, memories can grow and evolve, sometimes in unexpected ways.

Finally, psychologists and other therapists have become more aware of the possibility of inadvertently creating false memories in therapy (Davis & Loftus, 2009). Guidelines have been developed to help mental health professionals avoid unintentionally creating false memories in clients (American Psychological Association Working Group, 1998; Colangelo, 2007).

CRITICAL THINKING QUESTIONS

- Why is it difficult to determine the accuracy of a "memory" that is recovered in therapy?
- How could the phenomenon of source confusion be used to explain the production of false memories?

CONCEPT REVIEW 6.2

Factors That Affect Retrieval and Forgetting

Circle the letter of the correct answer.

1. Lila discovered an old box of childhood toys stored in her attic. As she sorted through the box, she was flooded with memories of long-forgotten friends and experiences, including her first day of school and the games she played with neighborhood children. The toys were acting as:
   a. cues that activated repressed memories
   b. chunking cues
   c. serial position cues
   d. retrieval cues

2. Juan always studied alone in the college library. He was surprised when he had difficulty remembering some information during his final exam, which he took in a large gymnasium with several hundred other students. One explanation for his forgetting information that he had studied could be:
   a. the context effect
   b. the misinformation effect
   c. the primacy effect
   d. source confusion

3. At a family reunion, Aunt Edna was surprised when her nephew Andrew said he couldn't remember falling and putting his hand through a window 20 years previously when he was 6 years old. But the more Andrew thought about the incident, the more the memory came back to him, and he began recalling vivid details of the scene. Only later did Andrew learn from his mother that Aunt Edna was wrong—she had confused Andrew with another nephew, Logan. Andrew had probably experienced:
   a. repression
   b. imagination inflation
   c. flashbulb interference
   d. encoding failure

4. Professor Ivanovich has many vivid memories of her students from last semester and can recall most of their names. Because of _____, she is having problems remembering her new students' names this semester.
   a. retroactive interference
   b. proactive interference
   c. decay
   d. suppression

5. Rob has a very vivid memory of a bad traffic accident that occurred near his home when he was a child. His mother, however, claims that Rob couldn't have witnessed the incident because he was in bed, asleep, when it occurred, and that he had learned about the accident from television news reports. Rob's false memory is probably the result of:
   a. retrieval cue failure
   b. repression
   c. flashbulb interference
   d. source confusion



The Search for the Biological Basis of Memory

KEY THEME

› Early researchers believed that memory was associated with physical changes in the brain, but these changes were discovered only in the past few decades.

KEY QUESTIONS

› How are memories both localized and distributed in the brain?

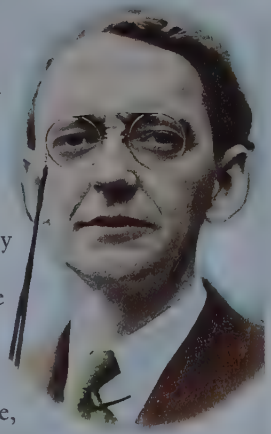
› How do neurons change when a memory is formed?

Does the name *Ivan Pavlov* ring a bell? We hope so. As you should recall from Chapter 5, Pavlov was the Russian physiologist who classically conditioned dogs to salivate to the sound of a bell and other neutral stimuli. Without question, learning and memory are intimately connected. Learning an adaptive response depends on our ability to form new memories in which we associate environmental stimuli, behaviors, and consequences.

Pavlov (1927) believed that the memory involved in learning a classically conditioned response would ultimately be explained as a matter of changes in the brain. However, Pavlov only speculated about the kinds of brain changes that would produce the memories needed for classical conditioning to occur. Other researchers would take up the search for the physical changes associated with learning and memory. In this section, we look at some of the key discoveries that have been made in trying to understand the biological basis of memory.

memory trace or **engram** The hypothetical brain changes associated with a particular stored memory.

The Search for the Elusive Memory Trace



Karl S. Lashley (1890–1958) Lashley was trained as a zoologist but turned to psychology after he became friends with John B. Watson, the founder of behaviorism. Interested in discovering the physical basis of the conditioned reflex, Lashley focused his research on how learning and memory were represented in the brain. After years of frustrating research, Lashley (1950) humorously concluded, "This series of experiments has yielded a good bit of information about what and where memory is not. It has discovered nothing directly of the real nature of the engram. I sometimes feel in reviewing the evidence on the localization of the memory trace, that the necessary conclusion is that learning just is not possible."

Archives of the History of American Psychology, The University of Akron.

An American physiological psychologist named **Karl Lashley** set out to find evidence for Pavlov's speculations. In the 1920s, Lashley began the search for the **memory trace,** or **engram**—the brain changes that were presumed to occur in forming a long-term memory (see photo caption). Guiding Lashley's research was his belief that memory was *localized,* meaning that a particular memory was stored in a specific brain area.

Lashley searched for the specific location of the memory trace that a rat forms for running a maze. Lashley (1929) suspected that the specific memory was localized at a specific site in the *cerebral cortex,* the outermost covering of the brain that contains the most sophisticated brain areas. Once a rat had learned to run the maze, Lashley surgically removed tiny portions of the rat's cortex. After the rat recovered, Lashley tested the rat in the maze again. Obviously, if the rat could still run the maze, then the portion of the brain removed did not contain the memory.

Over the course of 30 years, Lashley systematically removed different sections of the cortex in trained rats. The result of Lashley's painstaking research? No matter which part of the cortex he removed, the rats were still able to run the maze (Lashley, 1929, 1950). At the end of his professional career, Karl Lashley concluded that memories are not localized in specific locations but instead are *distributed,* or stored, throughout the brain.

Lashley was wrong, but not completely wrong. Some memories *do* seem to be localized at specific spots in the brain. Some 20 years after Lashley's death, psychologist **Richard F. Thompson** and his colleagues resumed the search for the location of the memory trace that would confirm Pavlov's speculations.

Thompson classically conditioned rabbits to perform a very simple behavior—an eye blink. By repeatedly pairing a tone with a puff of air administered to the rabbit's eye, he classically conditioned rabbits to blink reflexively in response to the tone alone (Thompson, 1994, 2005).

Thompson discovered that after a rabbit had learned this simple behavior, there was a change in the brain activity in a small area of the rabbit's *cerebellum,* a lower brain structure involved in physical movements. When this tiny area of the cerebellum was removed, the rabbit's memory of the learned response disappeared. It no longer blinked at the sound of the tone. However, the puff of air still caused the rabbit to blink reflexively, so the reflex itself had not been destroyed.

Thompson and his colleagues had confirmed Pavlov's speculations. The long-term memory trace of the classically conditioned eye blink was formed and stored in a very localized region of the cerebellum.

So why had Karl Lashley failed? Unlike Thompson, Lashley was working with a relatively complex behavior. Running a maze involves the use of several senses, including vision, smell, and touch. In contrast, Thompson's rabbits had learned a very simple reflexive behavior—a classically conditioned eye blink.

Thus, part of the reason Lashley failed to find a specific location for a rat's memory of a maze was that the memory was not a single memory. Instead, the rat had developed a complex set of *interrelated memories* involving information from multiple senses. These interrelated memories were processed and stored in different brain areas. As a result, the rat's memories were *distributed* and stored across multiple brain locations. Hence, no matter which small brain area Lashley removed, the rat could still run the maze. So Lashley was right in suggesting that some memories are distributed throughout the brain.

Combined, the findings of Lashley and Thompson indicate that memories have the potential to be *both localized* and *distributed.* Very simple memories may be localized in a specific area, whereas more complex memories are distributed throughout the brain. A complex memory involves clusters of information, and each part of the memory may be stored in the brain area that originally processed the information (Greenberg & Rubin, 2003).



Richard F. Thompson (b. 1930)
Like Karl Lashley, Richard Thompson (1994, 2005), sought to discover the neurobiological basis for learning and memory. But, unlike Lashley, Thompson (2005) decided to use a very simple behavior—a classically conditioned eye blink—as a model system to locate a memory trace in the brain. He succeeded, identifying the critical region in the cerebellum where the memory of the learned behavior was stored.

APS OBSERVER by APS. ©2008 by Association for Psychological Science. Reproduced with permission of Association for Psychological Science.

long-term potentiation A long-lasting increase in synaptic strength between two neurons.

Adding support to Lashley's and Thompson's findings, brain imaging technology has confirmed that many kinds of memories are distributed in the human brain. When we are performing a relatively complex memory task, multiple brain regions are activated—evidence of the distribution of memories involved in complex tasks (Frankland & Bontempi, 2005; Khan & Muly, 2011).

The Focus on Neuroscience describes a clever study that looked at how memories involving different sensory experiences are assembled when they are retrieved.

The Role of Neurons in Long-Term Memory

What exactly is it that is localized or distributed? The notion of a memory trace suggests that some change must occur in the workings of the brain when a new long-term memory is stored. Logically, two possible changes could occur. First, the *functioning* of the brain's neurons could change. Second, the *structure* of the neurons could change.

Given those two possibilities, the challenge for memory researchers has been to identify the specific neurons involved in a given memory, a task that is virtually impossible with the human brain because of its enormous complexity. What this task required was a creature with a limited number of neurons that is also capable of learning new memories.

FOCUS ON NEUROSCIENCE

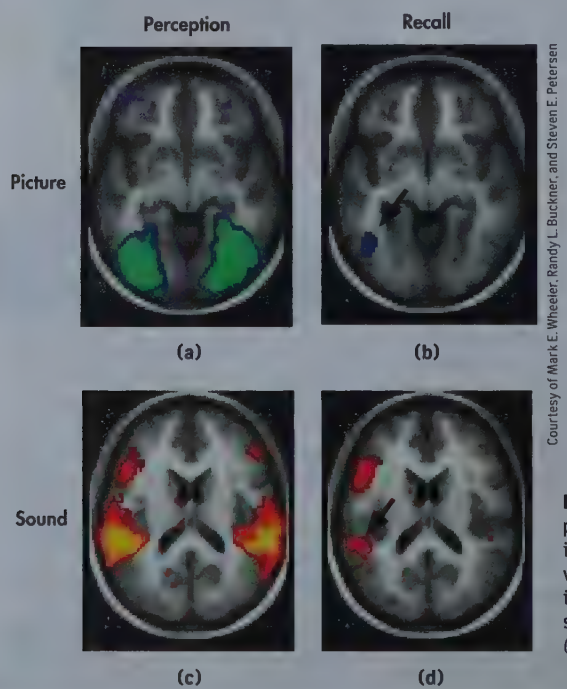
Assembling Memories: Echoes and Reflections of Perception

If we asked you to remember the theme from *Sesame Street*, you would "hear" the song in your head. Conjure up a memory of your high school cafeteria, and you "see" it in your mind. Memories can include a great deal of sensory information—sounds, sights, and even odors, textures, and tastes. How are such rich sensory aspects of an experience incorporated into a memory that is retrieved?

Researchers set out to investigate this question using a simple memory task and fMRI (Wheeler & others, 2000). Participants studied names for common objects that were paired with either a picture or a sound associated with the word. For example, the word "dog" was either paired with a picture of a dog or the sound of a dog barking. The researchers then used fMRI to measure brain activity when the volunteers were instructed to recall the words they'd memorized.

The results? Retrieving the memory activated a subset of the same brain areas that were involved in perceiving the sensory stimulus. Participants who had memorized the word *dog* with a *picture* of a dog showed a high level of activation in the *visual cortex* when they retrieved the memory. And participants who had memorized the word *dog* with the *sound* of a barking dog showed a high level of activation in the *auditory cortex* when they retrieved the memory.

Of course, many of our memories are highly complex, involving not just sensations but also thoughts and emotions. Neuroscientists assume that such complex memories involve traces that are widely distributed throughout the brain. However, they still don't understand how all these neural records are bound together and interrelated to form a single, highly elaborate memory (Khan & Muly, 2011).



Courtesy of Mark E. Wheeler, Randy L. Buckner, and Steven E. Petersen

Retrieving the Memory of a Sensory Experience Top row: **(a)** Perceiving a picture activates areas of the visual cortex. **(b)** When the memory of the picture is recalled, it reactivates some of the same areas of the visual cortex *(arrow)* that were involved in the initial perception of the picture. Bottom row: **(c)** Perceiving a sound activates areas of the auditory cortex. **(d)** When the memory of the sound is recalled, it reactivates some of the same areas of the auditory cortex *(arrow)* that were involved in the initial perception of the sound.

Enter *Aplysia*, a gentle, seaweed-munching sea snail that resides off the California coast. The study of *Aplysia* over the past 30 years has given memory researchers important insights into the brain changes involved in memory. Why *Aplysia*? Because *Aplysia* has only about 20,000 good-sized neurons. That was a key reason why memory researcher **Eric Kandel** (2006, 2009) chose this unassuming creature to study the neuronal changes that occur when a new memory is formed for a simple classically conditioned response.

If you give *Aplysia* a gentle squirt with a WaterPik, followed by a mild electric shock to its tail, the snail reflexively withdraws its gill flap. When the process is repeated several times, *Aplysia* wises up and acquires a new memory of a classically conditioned response—it withdraws its gill when squirted with the WaterPik alone. This learned gill-withdrawal reflex seems to involve a circuit of just three neurons: one that detects the water squirt, one that detects the tail shock, and one that signals the gill-withdrawal reflex (see Figure 6.10).

When *Aplysia* acquires this new memory through repeated training trials, significant changes occur in the three-neuron circuit (Kandel, 2001). First, the *function* of the neurons is altered: There is an increase in the amount of the neurotransmitters produced by the neurons. Second, the *structure* of the snail's neurons changes: The number of interconnecting branches between the neurons increases, as does the number of synapses, or communication points, on each branch. These changes allow the neurons involved in the particular memory circuit to communicate more easily. Collectively, these changes are called **long-term potentiation,** which refers to a long-lasting increase in synaptic strength (Fedulov & others, 2007; Baudry & others, 2011).

The same kinds of brain changes have been observed in more sophisticated mammals. Chicks, rats, and rabbits also show structural and functional neuron changes associated with new learning experiences and memories. And, as you may recall from Enhancing Well-Being with Psychology in Chapter 2, there is ample evidence that the same kinds of changes occur in the human brain.

In terms of our understanding of the memory trace, what do these findings suggest? Although there are vast differences between the nervous system of a simple creature such as *Aplysia* and the enormously complex human brain, some tentative generalizations are possible. Forming a memory seems to produce distinct functional



Karen Kuehn

***Aplysia*, the Supersnail of Memory Research** Eric Kandel holds *Aplysia*, the sea snail that is used to study how neurons change when simple behaviors are learned and remembered. Kandel was awarded the Nobel Prize in 2000 for his discoveries on the neural basis of memory.

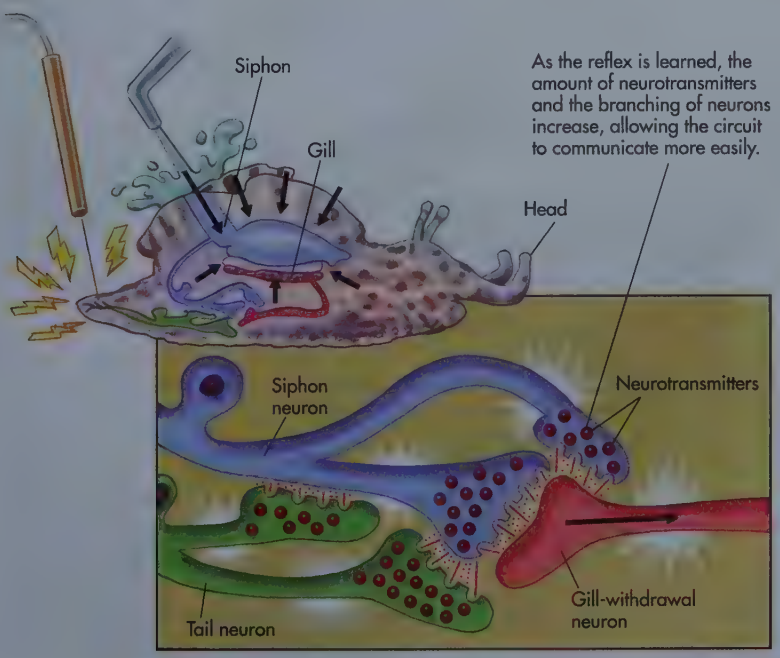
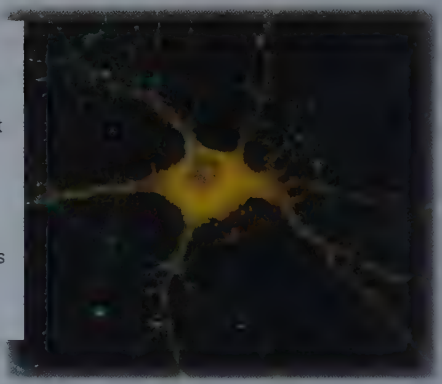


FIGURE 6.10 How Neurons Change as *Aplysia* Forms a New Memory When *Aplysia* is repeatedly squirted with water, and each squirt is followed by a mild shock to its tail, the snail learns to withdraw its gill flap if squirted with the water alone. Conditioning leads to structural and functional changes in the three neurons involved in the memory circuit.

Creating New Synaptic Connections
Forming new memories involves strengthening existing synaptic connections and creating new synaptic connections between neurons in the brain. Neuroscientist Michael Colicos and his colleagues at the University of California–San Diego (2001) photographed structural changes in a single hippocampus neuron that occurred in response to repeated electrical stimulation. The spidery blue lines in the photo are physical changes in the neuron's structure that represent the first steps toward the formation of new synaptic connections with other neurons.



Michael Colicos, UCSD

and structural changes in specific neurons. These changes create a memory circuit. Each time the memory is recalled, the neurons in this circuit are activated. As the structural and functional changes in the neurons strengthen the communication links in this circuit, the memory becomes established as a long-term memory (Kandel, 2006, 2009).

CONCEPT REVIEW 6.3

Remembering Famous Names

Match each of the following names with one of the descriptions below: Eric Kandel, George Sperling, Hermann Ebbinghaus, Richard F. Thompson, Elizabeth Loftus, Karl Lashley.

1. The psychologist who identified the duration of visual sensory memory _____
2. One of the most widely recognized experts on memory distortions, eyewitness testimony, and false memories _____
3. The psychologist who was one of the first people to scientifically study memory and forgetting _____
4. The psychologist who tried but failed to find the specific location of individual memories in the brain _____
5. The psychologist who succeeded in identifying the specific brain location of a simple classically conditioned response _____
6. The neuroscientist who won a Nobel Prize for his success in determining the neural basis of memory in *Aplysia* _____

Processing Memories in the Brain

Clues from Amnesia

KEY THEME

› Important insights into the brain structures involved in normal memory have been provided by case studies of people with amnesia caused by damaged brain tissue.

KEY QUESTIONS

› Who was H.M. and what did his case reveal about normal memory processes?
› What brain structures are involved in normal memory?
› What are dementia and Alzheimer's disease?

- **amnesia** (am-NEE-zha) Severe memory loss.
- **retrograde amnesia** Loss of memory, especially for episodic information; backward-acting amnesia.
- **memory consolidation** The gradual, physical process of converting new long-term memories to stable, enduring memory codes.
- **anterograde amnesia** Loss of memory caused by the inability to store new memories; forward-acting amnesia.

Prior to the advent of today's sophisticated brain-imaging technology, researchers studied individuals who had sustained a brain injury or had part of their brain surgically removed for medical reasons. Often, such individuals experienced **amnesia,** or severe memory loss. By relating the type and extent of amnesia to the specific damaged brain areas, researchers uncovered clues as to how the human brain processes memories.

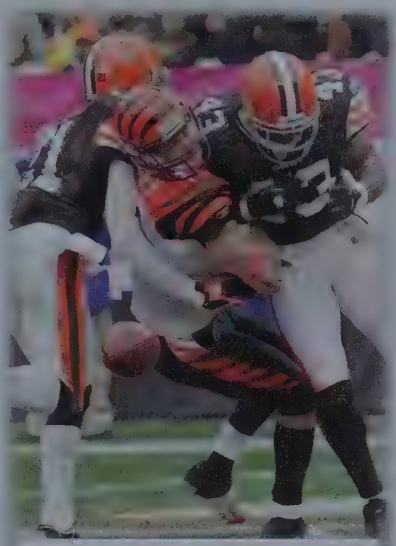
Retrograde Amnesia

Disrupting Memory Consolidation

One type of amnesia is retrograde amnesia. *Retrograde* means "backward moving." People who have **retrograde amnesia** are unable to remember some or all of their past, especially episodic memories for recent events. Retrograde amnesia often results from a blow to the head. Boxers sometimes suffer such memory losses after years of fighting. Head injuries from automobile and motorcycle accidents are another common cause of retrograde amnesia. Typically, memories of the events that immediately preceded the injury are completely lost, as in the case of accident victims who cannot remember details about what led up to the accident.

Apparently, establishing a long-term memory is like creating a Jell-O mold—it needs time to "set" before it becomes solid. This process of "setting" a new memory permanently in the brain is called memory consolidation (Dudai & others, 2011). More specifically, **memory consolidation** is the gradual, physical process of converting new long-term memories to stable, enduring memory codes (Medina & others, 2008). If memory consolidation is disrupted before the process is complete, the vulnerable memory may be lost (Dudai, 2004).

In humans, memory consolidation can be disrupted by brain trauma, such as a sudden blow, concussion, electric shock, or encephalitis (Riccio & others, 2003). Similarly, many drugs, such as alcohol and the benzodiazepines, interfere with memory consolidation. In contrast, stimulants and the stress hormones that are released during emotional arousal tend to *enhance* memory consolidation (Nielson & Lorber, 2009).



AP Photo/Amy Sancetta

Disrupting the Consolidation of Memories Head injuries are common in football and many other sports. Cincinnati Bengals wide receiver Jordan Shipley, pictured here, was left with a concussion after being hit by two Cleveland Browns players. In one study, football players who were questioned immediately after a concussion or other head injury could remember how they were injured and the name of the play just performed. But if questioned 30 minutes later for the same information, they could not. Because the head injury had disrupted the memory consolidation process, the memories were permanently lost (Yarnell & Lynch, 1970).

Anterograde Amnesia

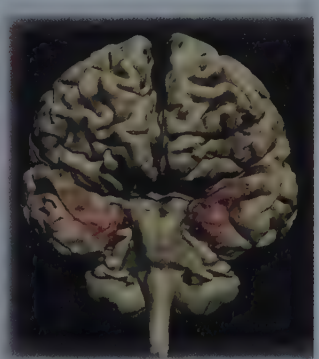
Disrupting the Formation of Explicit Memories

Another form of amnesia is **anterograde amnesia**—the inability to form *new* memories. *Anterograde* means "forward moving." The most famous case study of anterograde amnesia lasted over 50 years. It was of a man who for years was known only by his initials—H.M. But the need to protect H.M.'s privacy ended when Henry Molaison died at the age of 82 on December 2, 2008.

In 1953, Henry was 27 years old and had a 10-year history of severe, untreatable epileptic seizures. Henry's doctors located the brain area where the seizures seemed to originate. With no other options available at the time, the decision was made to surgically remove portions of the *medial* (inner) *temporal lobe* on each side of Henry's brain, including the brain structure called the *hippocampus* (Scoville & Milner, 1957).



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Copyright The brain Observatory, UC San Diego

Henry Gustav Molaison: The Real H.M. (1926–2008)
At the age of 9, Henry was hit hard by a bicyclist and jarred his head badly. Not long after, Henry began experiencing seizures. By early adulthood, Henry's seizures had increased in both severity and frequency. In an effort to control the seizures, Dr. William Beecher Scoville performed an experimental surgery, removing the hippocampus and amygdala on each side of Henry's brain (right). It was the first—and last—time that the surgical procedure would be performed.

Because of the profound anterograde amnesia caused by the surgery, Henry became one of the most intensive case studies in psychology and neuroscience. Over the next half century, Henry participated in hundreds of studies that fundamentally altered the scientific understanding of memory.

Henry died on December 2, 2008, but his contributions to science continue. Neuroscientists at the Brain Observatory at the University of California–San Diego continue to study Henry's brain. This image, reconstructed from MRI and other data, shows the extent of the brain tissue that Scoville removed in an attempt to control H. M.'s seizures, indicated in red.



Suzanne Corkin Since the mid-1960s, MIT neuropsychologist Suzanne Corkin has evaluated different aspects of Henry's memory abilities. In looking back on Henry's life, Corkin (2002) commented, "We all understand the rare opportunity we have had to work with him, and we are grateful for his dedication to research. He has taught us a great deal about the cognitive and neural organization of memory. We are in his debt."

Courtesy of Suzanne Corkin

After the experimental surgery, the frequency and severity of Henry's seizures were greatly reduced. However, it was quickly discovered that Henry's ability to form new memories of events and information had been destroyed. Although the experimental surgery had treated H.M.'s seizures, it also dramatically revealed the role of the hippocampus in forming new explicit memories for episodic and semantic information.

Psychologists **Brenda Milner** and **Suzanne Corkin** studied Henry extensively over the past 50 years (Corkin, 1984; Milner, 1970; Scoville & Milner, 1957). If you had had the chance to meet Henry, he would have appeared normal enough. He had a good vocabulary and social skills, normal intelligence, and a delightful sense of humor. And he was well aware of his memory problem. When Suzanne Corkin (2002) once asked him, "What do you do to try to remember?" Henry quipped, "Well, that I don't know because I don't remember (chuckle) what I tried."

Despite superficially appearing normal, Henry lived in the eternal present. Had you talked with Henry for 15 minutes, then left the room for 2 or 3 minutes before coming back, he wouldn't remember having met you before. Although some of the psychologists and doctors had treated Henry for years, even decades, Henry was meeting them for the first time on each occasion he interacted with them (Corkin, 2002).

For the most part, Henry's short-term memory worked just fine. In fact, he could fool you. If Henry actively repeated or rehearsed information, he could hold it in short-term memory for an hour or more (Nader & Wang, 2006). Yet just moments after he switched his attention to something else and stopped rehearsing the information, it was gone forever. However, Henry's long-term memory was partially intact. He could retrieve long-term memories from *before* the time he was 16 years old, when the severe epileptic seizures began.

In general, Henry was unable to acquire new long-term memories of events (episodic information) or general knowledge (semantic information). Still, every now and then, Henry surprised his doctors and visitors with some bit of knowledge that he acquired after the surgery (see the In Focus box "H.M. and Famous People").

Henry's case suggests that the hippocampus is not involved in most short-term memory tasks, nor is it the storage site for already established long-term memories. Instead, the critical role played by the hippocampus seems to be the *encoding* of new memories for events and information and the *transfer* of those new memories from short-term to long-term memory.

Implicit and Explicit Memory in Anterograde Amnesia Henry's case and those of other patients with anterograde amnesia have contributed greatly to our understanding of implicit versus explicit memories. To refresh your memory, *implicit memories* are memories without conscious awareness. In contrast, *explicit memories* are memories with conscious awareness.

Henry could not form new episodic or semantic memories, which reflects the explicit memory system. But he *could* form new procedural memories, which reflects the implicit memory system. For example, when given the same logical puzzle to solve several days in a row, Henry was able to solve it more quickly each day. This improvement showed that he *implicitly* "remembered" the procedure involved in solving the puzzle. But if you asked Henry if he had ever seen the puzzle before, he would answer "no" because he could not consciously (or *explicitly*) remember having learned how to solve the puzzle. This suggests that the hippocampus is less crucial to the formation of new implicit memories, such as procedural memories, than it is to the formation of new explicit memories.

Were Henry's memory anomalies an exception? Not at all. Studies conducted with other people who have sustained damage to the hippocampus and related brain structures showed the same anterograde amnesia (e.g., Bayley & Squire, 2002). Like Henry, these patients are unable to form new explicit memories, but their performances on implicit memory tasks, which do not require conscious recollection of the new information, are much closer to normal. Such findings indicate that implicit and explicit memory processes involve different brain structures and pathways.

IN FOCUS

H.M. and Famous People

When his hippocampus was removed, Henry Molaison lost the ability to quickly encode new semantic and episodic memories. For example, he was unable to learn new vocabulary words or remember people he had met. But is the hippocampus necessary for *all* semantic learning? Or is it possible that other brain areas might support some limited learning of new knowledge?

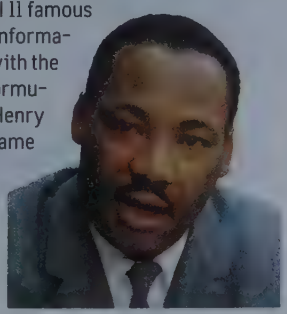
To test this idea, psychologists Gail O'Kane, Elizabeth Kensinger, and Suzanne Corkin (2004) evaluated Henry for his knowledge of people who became famous after his surgery in 1953. On the first day, Henry was given the famous person's first name as a cue and asked to say the last name that came to his mind. Examples were "Elvis _____ (Presley)" and "Fidel _____ (Castro)," who first became famous during the 1950s; "Lyndon _____ (Johnson)" and "Ray _____ (Charles)" from the 1960s; "Sophia _____ (Loren)" from the 1970s; and "Ronald _____ (Reagan)" from the 1980s. Henry was able to correctly supply the last name of 12 out of 35 famous people, including Martin Luther King, Sophia Loren, and Ronald Reagan.

In a second test on the next day, Henry was able to generate the last names for an additional 11 famous people after being given background information about them. For example, provided with the details "famous artist, born in Spain, formulated Cubism, works include *Guernica*," Henry responded "Picasso" to the cue "first name is Pablo."

Henry's ability to generate the last names of well-known people indicated that he had acquired some declarative semantic knowledge. O'Kane and her colleagues (2004) wondered whether Henry could go beyond this superficial knowledge and provide specific details. In a different test, Henry was able to provide two or more pieces of information about 12 people who had become prominent after the onset of his amnesia.

For example, after correctly identifying John F. Kennedy as a famous person, Henry indicated that Kennedy was Catholic, had become president, that somebody shot him, and that he didn't survive. Henry was also able to provide details about John Glenn, Ray Charles, Woody Allen, Liza Minnelli, and Sophia Loren.

According to O'Kane and her colleagues (2004), "These results provide robust, unambiguous evidence that at least some semantic learning can be supported by structures beyond the hippocampus." However, the limitations of Henry's semantic learning must also be stressed. Henry was still unable to quickly acquire new semantic or episodic memories. It was only after years of extended repetitions of information that Henry acquired some limited bits and pieces of new knowledge about a few famous people.


Bettmann/Corbis


AP Photo/Shizuo Kambayashi


Bettmann/Corbis

Brain Structures Involved in Memory

Along with the hippocampus, several other brain regions involved in memory include the cerebellum, the amygdala, and the frontal cortex (see Figure 6.11 on the next page). As you saw earlier, the *cerebellum* is involved in classically conditioning simple reflexes, such as the eye-blink reflex. The cerebellum is also involved in procedural memories and other motor skill memories.

The *amygdala*, which is situated very close to the hippocampus, is involved in encoding and storing the emotional qualities associated with particular memories, such as fear or anger (McGaugh, 2004; Hamann, 2009). For example, normal monkeys are afraid of snakes. But if the amygdala is damaged, a monkey loses its fear of snakes and other natural predators.

The *frontal lobes* are involved in retrieving and organizing information that is associated with autobiographical and episodic memories (Greenberg & Rubin, 2003). The *prefrontal cortex* seems to play an important role in working memory (McNab & Klingberg, 2008).

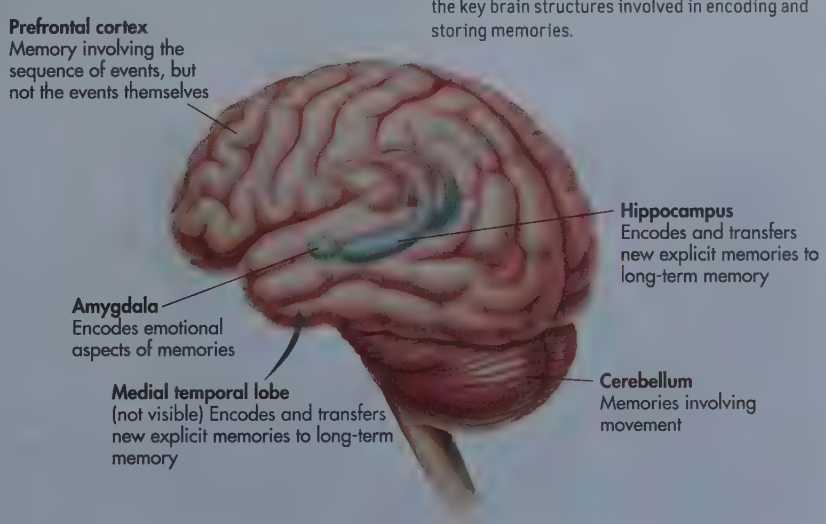


FIGURE 6.11 Brain Structures Involved in Human Memory Shown here are some of the key brain structures involved in encoding and storing memories.

The *medial temporal lobes,* like the frontal lobes, do not actually store the information that comprises our autobiographical memories. Rather, they are involved in encoding complex memories, by forming links among the information stored in multiple brain regions (Greenberg & Rubin, 2003; Shrager & Squire, 2009). As we described in the Focus on Neuroscience, "Assembling Memories," on page 262, retrieving a memory activates the same brain regions that were involved in initially encoding the memory.

Alzheimer's Disease

Gradually Losing the Ability to Remember

Understanding how the brain processes and stores memories has important implications. **Dementia** is a broad term that refers to the decline and impairment of memory, reasoning, language, and other cognitive functions. These cognitive disruptions occur to such an extent that they interfere with the person's ability to carry out daily activities. Dementia is not a disease itself. Rather, it describes a group of symptoms that often accompany a disease or a condition.

The most common cause of dementia is **Alzheimer's disease (AD).** It is estimated that about 5.4 million Americans suffer from AD. That number is expected to dramatically escalate as the first of the "baby boomers" are just now reaching age 65. The disease usually doesn't begin until after age 60, but the risk goes up with age. About 6 percent of men and women in the 65–74 age group have AD. Among adults age 85 and older, about half may have Alzheimer's disease (Alzheimer's Association, 2011).

Although the cause or causes of Alzheimer's disease are still unknown, it is known that the brains of AD patients develop an abundance of two abnormal structures—*beta-amyloid plaques* and *neurofibrillary tangles* (Ballard & others, 2011). The *plaques* are dense deposits of protein and other cell materials outside and around neurons. The plaques interfere with the ability of neurons to communicate, damaging the neurons to the point that they die. The *tangles* are twisted fibers that build up inside the neuron and interrupt the flow of nourishment to the neuron, ultimately causing the neuron to die. Although most older people develop some plaques and tangles in their brains, the brains of AD patients have them to a much greater extent (Petersen, 2002). The Focus on Neuroscience vividly portrays the progressive loss of neurons that is the root cause of Alzheimer's disease.

In the early stages of AD, the symptoms of memory impairment are often mild, such as forgetting the names of familiar people, forgetting the location of familiar places, or forgetting to do things. But as the disease progresses, memory loss and confusion become more pervasive. The person becomes unable to remember what month it is or the names of family members. Frustrated and disoriented by the inability to retrieve even simple information, the person can become agitated and moody. In the last stage of AD, internal brain damage has become widespread. The person no longer recognizes loved ones and is unable to communicate in any meaningful way. All sense of self and identity has vanished. At the closing stages, the person becomes completely incapacitated. Ultimately, Alzheimer's disease is fatal (Alzheimer's Association, 2011).

Some 14.9 million Americans provide unpaid care for a person with Alzheimer's disease or other dementia. These unpaid caregivers are primarily family members but also include friends and neighbors. In 2010, these caregivers

The Nun Study of Aging and Alzheimer's Disease Since 1986 David Snowdon (2002, 2003) has been studying 678 elderly Roman Catholic nuns. From a scientific perspective, the nuns are an ideal group to study because their lifestyles and environment are so similar. Although the study is ongoing, several findings have already emerged (see Riley & others, 2005; Tyas & others, 2007a, 2007b).

For example, the outward signs of Alzheimer's disease (AD) and the degree of brain damage evident at death are not perfectly correlated. Although some nuns had clear brain evidence of AD, they did not display observable cognitive and behavior declines prior to their deaths. Other nuns had only mild brain evidence of AD but showed severe cognitive and behavioral declines.

Interestingly, the sisters who displayed better language abilities when they were young women were less likely to display AD symptoms. This held true regardless of how much brain damage was evident at the time of their death (Iacono & others, 2009). As researcher Diego Iacono (2009) commented, "It's the first time that we're shown that a complex cognitive activity, like language ability, is connected with a neurodegenerative disease."



Karen Kasmauski/Corbis

FOCUS ON NEUROSCIENCE

Mapping Brain Changes in Alzheimer's Disease

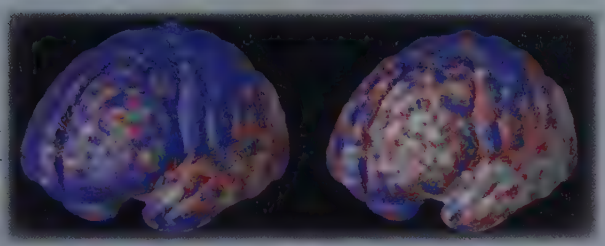
The hallmark of Alzheimer's disease is its relentless, progressive destruction of neurons in the brain, turning once-healthy tissue into a tangled, atrophied mass. This progressive loss of brain tissue is dramatically revealed in the MRI images shown below. Created by neuroscientist Paul Thompson and his colleagues (2003), these high-resolution "brain maps" represent composite images of the progressive effects of Alzheimer's disease (AD) in 12 patients over the course of two years. In these color-coded images, blue corresponds to normal tissue (no loss), red indicates up to 10 percent tissue loss, and white indicates up to 20 percent tissue loss.

Thompson likens the progression of AD to that of molten lava flowing around rocks—the disease leaves islands of brain tissue unscathed. The disease first attacks the temporal lobes, affecting areas involved in memory, especially short-term memory. Next affected are the frontal areas, which are involved in thinking, reasoning, self-control, and planning ahead. You can also see significant internal loss in limbic areas, which are involved in regulating emotion. At this point in the progression of AD, there is very little loss in sensory and visual brain areas. Eventually the disease engulfs the entire brain. The photos above contrast cross sections of a normal brain (left) and the brain of a person who died of Alzheimer's disease (right). In the normal brain, the temporal lobes are intact. The ventricles, which hold the cerebral spinal fluid, are slender. In the brain ravaged by Alzheimer's, the gaping ventricles extend into the space left by the death of brain cells in the temporal lobes.





National Geographic Image Collection/Maggie Steber



Dr. Paul Thompson, UCLA

initial diagnosis 18 months later

provided 17 billion hours of unpaid care (Alzheimer's Association, 2011). Not only is there a financial toll, but families and caregivers struggle with great physical and emotional stress as they try to cope with the mental and physical changes occurring in their loved one. The average number of hours of unpaid care provided for a relative or friend with Alzheimer's increases as the person's condition worsens.

Numerous resources, such as the Alzheimer's Disease Education & Referral Center (www.alzheimers.org) and the Alzheimer's Association (www.alz.org), are available to help support families and other caregivers.



CLOSING THOUGHTS

Human memory is at once both perfectly ordinary and quite extraordinary. With next to no mental effort, you form and recall countless memories as you go through daily life. Psychologists have made enormous progress in explaining how those memories are encoded, stored, retrieved, and forgotten.

Perhaps the most fascinating aspect of human memory is its fallibility. Memory is surprisingly susceptible to errors and distortions. Under some conditions, completely false memories can be experienced, such as Elizabeth Loftus's memory of discovering her mother's body in the swimming pool. Such false memories can be so subjectively compelling that they feel like authentic memories, yet confidence in a memory is not proof of the memory's truth.

Many mysteries of human memory remain, including exactly how memories are stored in and retrieved from the brain. Nevertheless, reliable ways of improving memory in everyday life have been discovered. In the Enhancing Well-Being with Psychology feature, we provide several suggestions to enhance your memory for new information.

dementia Progressive deterioration and impairment of memory, reasoning, and other cognitive functions occurring as the result of a disease or a condition.

Alzheimer's disease (AD) A progressive disease that destroys the brain's neurons, gradually impairing memory, thinking, language, and other cognitive functions, resulting in the complete inability to care for oneself; the most common cause of *dementia*.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Superpower Memory in Minutes per Day!

Yes, that's what many memory self-help programs promise you. But after you cut through all the hype, what are you left with? Mostly what we're going to give you in this section—some well-established and effective but less-than-magical strategies to help boost your memory for important information.

1. Space your study sessions.

Distributed practice means that you learn information over several sessions, which gives you time to mentally process and incorporate the information (Son, 2004). Students who take the distributed-practice approach to learning retain significantly more information than students who use cramming, or *massed practice* (Rohrer & Taylor, 2006).

2. Sleep on it to help consolidate those memories.

As we discussed in Chapter 4 [see pages 150–151] numerous studies have demonstrated that sleep helps you consolidate new memories (Payne & Kensinger, 2010; Walker, 2009). (Don't try this as an excuse in class.) Non-REM sleep (nondreaming) seems to help consolidate declarative memories, while dreaming REM sleep seems to help consolidate procedural memories (Diekelmann & Born, 2010). In other words, all-night cram sessions just before an exam are one of the *least* effective ways to learn new material.

3. Focus your attention.

Problems in absorbing new information arise when distracting thoughts, background noise, and other interruptions sidetrack your attention. Television and cell phones are common culprits. Rather than studying in front of the tube or responding to text messages, locate a quiet study space that's free from distractions so you can focus your attention. If distracting thoughts are competing for your attention, start your study session by reading aloud part of what you need to study.

4. Commit the necessary time.

The more time you spend learning material, the better you will understand it and the longer you will remember it. Budget enough time to read the assigned material carefully. If you read material faster than you can comprehend it, you not only won't understand the material, you also won't remember it.

5. Organize the information.

We have a strong natural tendency to organize information in long-term memory into categories. You can capitalize on this tendency by actively organizing information you want to remember. One way to accomplish this is by outlining chapters or your lecture notes. Use the chapter headings and subheadings as categories, or, better yet, create your own categories. Under each category, list and describe the relevant terms, concepts, and ideas. This strategy can double the amount of information you can recall.

6. Elaborate on the material.

You've probably noticed that virtually every term or concept in this text is formally defined in just a sentence or two. But we also spend a paragraph or more explaining what the concept means. To remember the information you read, you have to do the same thing—engage in *elaborative rehearsal* and actively process the information for meaning (see page 238). Actively question new information and think about its implications. Form memory associations by relating the material to what you already know. Try to come up with examples that relate to your own life.

7. Use visual imagery.

Two memory codes are better than one (Paivio, 1986). Rather than merely encoding the information verbally, use mental imagery (Carretti & others, 2007; Sadoski, 2005). Much of the information in this text easily lends itself to visual imagery. Use the photographs and other illustrations to help form visual memories of the information. A simple way to make text information visually distinct is to highlight different concepts in different colors.

8. Explain it to a friend.

After you read a section of material, stop and summarize what you have read in your own words. When you think you understand it, try explaining the information to a friend or family member. As you'll quickly discover, it's hard to explain material that you don't really understand! Memory research has shown that explaining new material in your own words forces you to integrate the new information into your existing knowledge base—an excellent way to solidify new information in your memory (Kornell, 2008).

9. Reduce interference within a topic.

If you occasionally confuse related terms and concepts, it may be because you're experiencing *interference* in your memories for similar information. To minimize memory interference for related information, first break the chapter into manageable sections, then learn the key information one section at a time. As you encounter new concepts, compare them with previously learned concepts, looking for differences and similarities. By building distinct memories for important information as you progress through a topic, you're more likely to distinguish between concepts so they don't get confused in your memory.



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10. Counteract the serial position effect.

The *serial position effect* is the tendency to have better recall of information at the beginning and end of a sequence. To counteract this effect, spend extra time learning the information that falls in the middle. Once you've mastered a sequence of material, start at a different point each time you review or practice the information.

11. Use contextual cues to jog memories.

Ideally, study in the setting in which you're going to be tested. If that's not possible, when you're taking a test and a specific memory gets blocked, imagine that your books and notes are in front of you and that you're sitting where you normally study. Simply imagining the surroundings where you learned the material can help jog those memories.

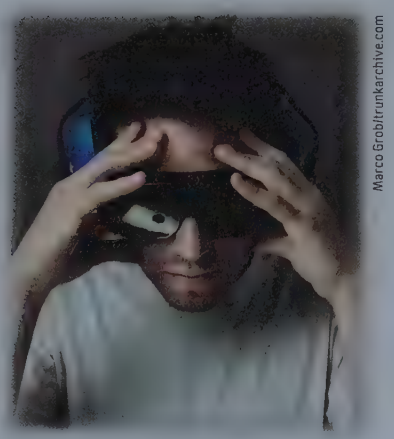
12. Use a mnemonic device for remembering lists.

A *mnemonic device* is a method or strategy to aid memory. Some of the most effective mnemonic devices use visual imagery (Foer, 2011). For example, the *method of loci* is a mnemonic device in which you remember items by visualizing them at specific locations in a familiar setting, such as the different rooms in your house or at specific locations on your way to work or school. To recall the items, mentally revisit the locations and imagine the specific item at that location.

Another mnemonic that involves creating visual associations is the *peg-word method*. First, you learn an easily remembered list containing the peg words, such as: 1 is bun, 2 is shoe, 3 is tree, 4 is door, 5 is hive, 6 is sticks, 7 is heaven, 8 is gate, 9 is vine, 10 is a hen, and you can keep going as needed. Then, you create a vivid mental image associating the first item you want to remember with the first peg word, the next item with the next peg word, and so on. To recall the list, use each successive peg word to help retrieve the mental image.

13. Forget the ginkgo biloba.

Think you can supercharge your memory banks by taking the herb *ginkgo biloba*? If only it were that easy! Researcher Paul R. Solomon and his colleagues (2002) pitted ginkgo against a placebo in a randomized, double-blind study for six weeks involving over 200 participants who were mentally healthy. The bottom line? No effect. The ginkgo biloba did not improve performance on tests of learning, memory, attention, or concentration. Other studies have come to the same conclusion (see Canter & Ernst, 2007).



Marco Grob/trunkarchive.com

Memory Superstar Josh Foer Journalist Josh Foer (2011) visited a memory competition expecting to find people with special memory abilities. Instead, he encountered a group of "mental athletes"—people with ordinary minds who had trained their memories to accomplish incredible feats, such as reciting hundreds of random digits or pages of poetry. Told that anyone could develop an expert memory with training, he set out to prove it and devoted months to training his own memory. A year later, he won the USA Memory Championship and even set a new U.S. record by memorizing the position of a deck of cards in one minute, 40 seconds. Josh's secret? Mnemonic techniques, like the *method of loci*—and lots and lots of practice.

CHAPTER REVIEW

Memory

KEY POINTS

Introduction: What Is Memory?

- **Memory** refers to the mental processes that enable us to acquire, retain, and retrieve information. Key memory processes are **encoding, storage,** and **retrieval.**

The Stage Model of Memory

- The **stage model of memory** describes human memory as the process of transferring information from one memory stage to another. The three stages of memory are sensory memory, short-term memory, and long-term memory.
- **Sensory memory** briefly stores information about the environment. Information that we attend to is transferred from sensory memory to short-term memory; other information fades quickly.
- George Sperling discovered that visual sensory memory holds information for about half a second before the information fades.
- There is a separate sensory memory for each sense. Visual and auditory sensory memory are the most thoroughly studied. Auditory sensory memory lasts up to a few seconds.
- **Short-term memory** provides temporary storage for information transferred from sensory memory and information recalled from **long-term memory. Maintenance rehearsal** keeps information active in short-term memory. Because of either decay or interference, information that is not rehearsed is lost within about 20 seconds.
- The capacity of short-term memory is limited to about seven items, plus or minus two. **Chunking** can be used to increase the amount of information held in short-term memory.
- Alan Baddeley's model of **working memory** has three components: the phonological loop, the visuospatial sketchpad, and the central executive. Working memory is the short-term memory system that involves the active, conscious manipulation of verbal or spatial information.

- Long-term memory stores a limitless amount of information for extended periods of time.
- Encoding transforms information into a form that can be stored and retrieved later. The most effective encoding strategies involve **elaborative rehearsal.**
- Long-term memory includes **procedural, episodic,** and **semantic memory. Explicit memories** can be consciously recalled. **Implicit memories** cannot be consciously recalled, but affect behavior or performance. Information in long-term memory is **clustered** into related groups during recall. The **semantic network model** describes the organization of long-term memory.

Retrieval: *Getting Information from Long-Term Memory*

- **Retrieval** refers to the process of accessing information stored in long-term memory.
- **Retrieval cues** are hints that help us retrieve stored memories. Sometimes stored memories cannot be retrieved because of **retrieval cue failure,** such as in **tip-of-the-tongue (TOT) experiences.**
- Retrieval can be tested using **recall, cued recall,** and **recognition** measures. The **serial position effect** is our tendency to remember best the first and last items in a series.
- According to the **encoding specificity principle,** re-creating aspects of the original learning conditions is one way to increase retrieval effectiveness. Examples of the encoding specificity principle include the **context effect** and **mood congruence.**
- Memories that are highly unusual tend to be easier to retrieve from long-term memory. **Flashbulb memories** can be extremely vivid, but, like normal memories, they are not always accurate.

Forgetting: *When Retrieval Fails*

- **Forgetting** refers to the inability to recall information that was previously available.
- The general pattern of forgetting is reflected in the forgetting curve, which is based on the classic research of Hermann Ebbinghaus.
- Psychologists have identified several factors that contribute to forgetting. **Encoding failure,** one cause of forgetting, is especially common when attention is divided. Divided attention may contribute to **déjà vu** experiences. Retrieval cue failure is implicated in **prospective memory** failures. **Decay theory** makes sense intuitively but has little research support.

According to **interference theory,** forgetting results from **retroactive** and **proactive interference** with other information. Motivated forgetting can result from **suppression** or **repression.** Research support for repression is mixed.

Imperfect Memories: *Errors, Distortions, and False Memories*

- Misidentification by eyewitnesses is the leading cause of false conviction in rape and murder cases. Because retrieval involves the reconstruction of memories, memory details can become distorted. The **misinformation effect** and **source confusion** are both potential causes of eyewitness error and **false memories. Schemas** and **scripts** also contribute to memory errors.
- **Imagination inflation** helps explain how false memories of childhood experiences can be created. Being lost in a shopping mall and putting slime in the teacher's desk in elementary school are some examples of false memory studies. Imagining vivid sensory details adds greatly to confidence in false memories.

The Search for the Biological Basis of Memory

- After extensive research, Karl Lashley concluded that memories are distributed rather than localized as a **memory trace.** Richard Thompson showed the physical changes that are associated with a simple conditioned reflex in rabbits. Today, it is believed that memories are both localized and distributed. Complex memories involve interrelated changes among many different brain areas.
- Eric Kandel showed that functional and structural changes in neurons are associated with acquiring a conditioned reflex in the sea snail *Aplysia*. Enduring memories are believed to be stored through **long-term potentiation,** a long-lasting increase in synaptic strength.
- **Retrograde amnesia** results when **memory consolidation** is disrupted. **Anterograde amnesia** results when the hippocampus is damaged, as in the case of H.M. **Amnesia** affects episodic memories rather than procedural memories and explicit memory rather than implicit memory. Brain structures involved in memory include the hippocampus, the amygdala, the cerebellum, the frontal lobes, the medial temporal lobes, and the prefrontal cortex.
- **Alzheimer's disease (AD)** is the most common cause of **dementia,** which refers to impairment in memory, reasoning, language, and other cognitive functions.

KEY TERMS

memory, p. 232
encoding, p. 232
storage, p. 232
retrieval, p. 232
stage model of memory, p. 232
sensory memory, p. 232
short-term memory, p. 233
long-term memory, p. 233
maintenance rehearsal, p. 235
chunking, p. 236
working memory, p. 237
elaborative rehearsal, p. 238
procedural memory, p. 239
episodic memory, p. 240
semantic memory, p. 240
explicit memory, p. 240
implicit memory, p. 240
clustering, p. 242
semantic network model, p. 242
retrieval, p. 243
retrieval cue, p. 243
retrieval cue failure, p. 243
tip-of-the-tongue (TOT) experience, p. 244
recall, p. 244
cued recall, p. 244
recognition, p. 245
serial position effect, p. 245
encoding specificity principle, p. 245
context effect, p. 245
mood congruence, p. 246
flashbulb memory, p. 246
forgetting, p. 247
encoding failure, p. 249
déjà vu experience, p. 250
source memory (source monitoring), p. 250
prospective memory, p. 250
decay theory, p. 251
interference theory, p. 251
retroactive interference, p. 251
proactive interference, p. 251
suppression, p. 252
repression, p. 252
misinformation effect, p. 254
source confusion, p. 254
false memory, p. 255
schema, p. 255
script, p. 255
imagination inflation, p. 258
memory trace, p. 261
long-term potentiation, p. 263
amnesia, p. 265
retrograde amnesia, p. 265
memory consolidation, p. 265
anterograde amnesia, p. 265
dementia, p. 268
Alzheimer's disease (AD), p. 268

KEY PEOPLE

Suzanne Corkin (b. 1937) American neuropsychologist who has extensively investigated the neural basis of memory, including several investigations of the famous amnesia patient H.M. (p. 266)

Hermann Ebbinghaus (1850–1909) German psychologist who originated the scientific study of forgetting; plotted the first forgetting curve, which describes the basic pattern of forgetting learned information over time. (p. 247)

Eric Kandel (b. 1929) American neurobiologist, born in Austria, who won a Nobel Prize in 2000 for his work on the neural basis of learning and memory in the sea snail *Aplysia*. (p. 263)

Karl Lashley (1890–1958) American physiological psychologist who attempted to find the specific brain location of particular memories. (p. 261)

Elizabeth F. Loftus (b. 1944) American psychologist who has conducted extensive research on the memory distortions that can occur in eyewitness testimony. (p. 253)

Brenda Milner (b. 1918) Canadian neuropsychologist whose groundbreaking research on the role of brain structures and functions in cognitive processes helped establish neuropsychology as a field; extensively studied the famous amnesia patient H.M. (p. 266)

George Sperling (b. 1934) American psychologist who identified the duration of visual sensory memory in a series of classic experiments in 1960. (p. 233)

Richard F. Thompson (b. 1930) American psychologist and neuroscientist who has conducted extensive research on the neurobiological foundations of learning and memory. (p. 261)

CONCEPT REVIEW ANSWERS

6.1 page 242

1. LTM 2. SM 3. STM 4. LTM
5. STM 6. SM 7. STM 8. SM 9. LTM

6.2 page 260

1. d 2. a 3. b 4. b 5. d

6.3 page 264

1. George Sperling
2. Elizabeth Loftus
3. Hermann Ebbinghaus
4. Karl Lashley
5. Richard F. Thompson
6. Eric Kandel



Web Companion Review Activities

You can find additional review activities at www.worthpublishers.com/hockenbury6e

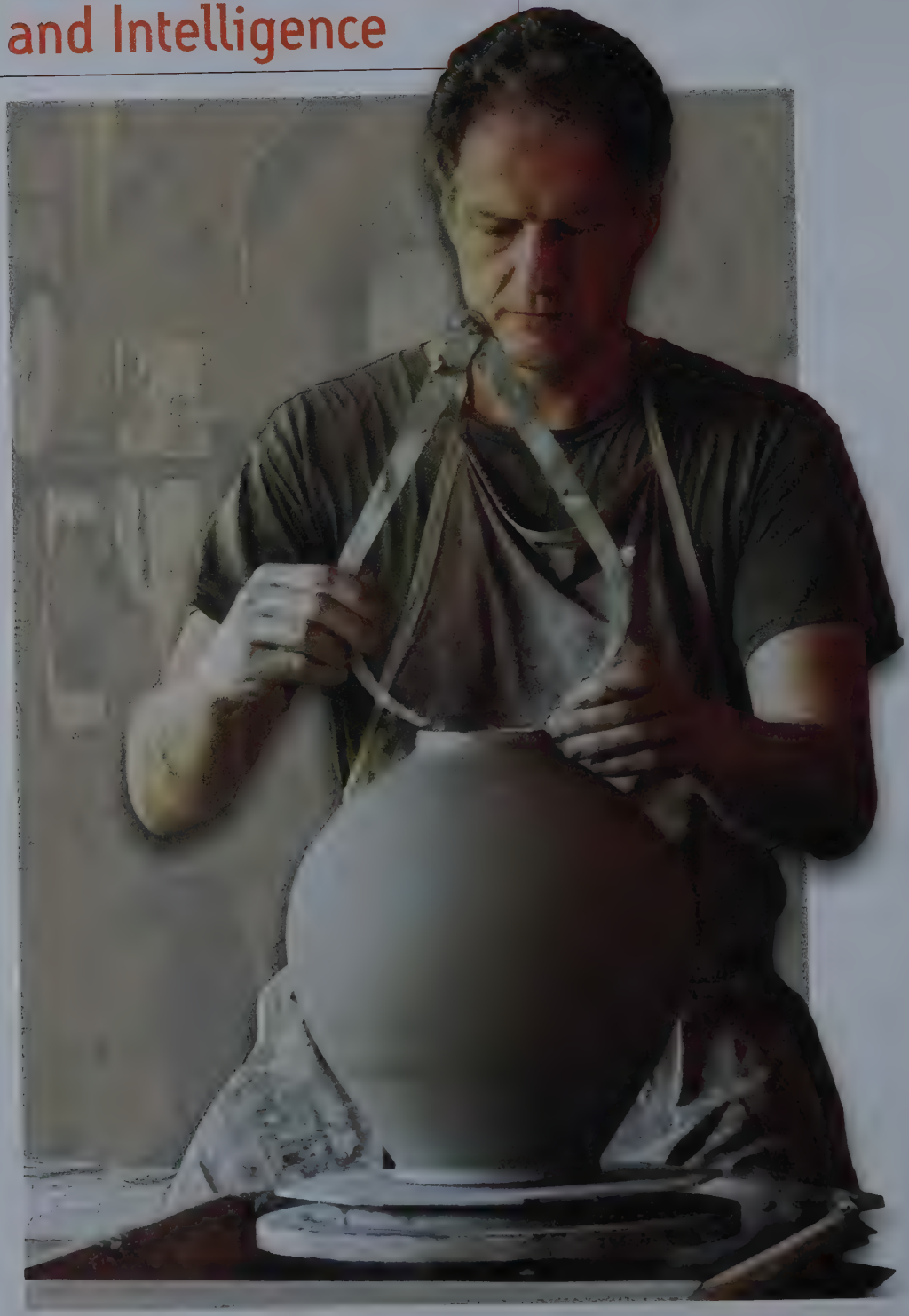
The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.



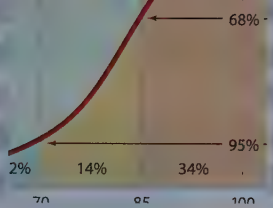


CHAPTER 7

Thinking, Language, and Intelligence







The Movie Moment

PROLOGUE

MOUNT MAGAZINE STATE PARK WAS an easy three-hour drive, so when my friend Lynn and her family invited me to join them for the evening in the hilltop cabin they'd rented, I jumped at the chance. They were lined up to greet me as I pulled up to their cabin in my dusty Subaru. Lynn and Will, relaxed and smiling, were happy to be on vacation with their two teenagers in such a beautiful location. Lily, laughing and talkative, was excited about starting college in the fall. And Tom, Lily's younger brother, was standing off to one side, looking away.

"Tom," Lynn prompted, "Tom, say hello to Sandy."

Ducking his head, Tom looked out from beneath his baseball cap. "Hell-oooooooo," he said with an odd, singsongy voice, then quickly turned away.

"Good to see you, Tom," I replied. If you didn't know Tom, you might think he was being rude. But I was well aware of Tom's "oddball habits," as he called them, which were most noticeable when he interacted with other people.

Later, as we hiked to the top of Mount Magazine and savored the incredible view of the river valley below, I thought of some of the conversations that Lynn and I had had over the years about Tom. When Tom was three, a preschool teacher had recommended that he be screened for vague "developmental delays." She wrote, "Tom doesn't interact with the other children." Sometimes, she said, he was "unresponsive," and seemed "lost in his own world." But Lynn and Will thought Tom was just shy.

Tom was unusual in other ways, too. He was smart—very smart. At the age of four, Tom had the reading and writing abilities of a child twice his age. Although he seldom talked, when Tom *did* talk, you couldn't help but do a double-take in response to his large vocabulary. And like lots of little boys, Tom would become obsessed with a particular topic. On one of my yearly visits, it was volcanoes; on another, construction equipment. But ***unlike*** lots of other little boys, Tom had little interest in anything other than his obsessions.

As Tom got older, it became harder to minimize the differences between him and his peers. In middle school, while other kids were joining sports teams and expanding their social circles, Tom's only friends were online chat room acquaintances. Lynn and Will signed Tom up for scouts, tennis lessons, and other group activities, but Tom would sit on the sidelines.

Tom was in the eighth grade when Will experienced what he later called "the movie moment." He was reading a magazine article about artists who shared several unusual personality characteristics. An obsessive interest in a single topic or object. High intelligence. Unusual speech patterns. An inability to "read" other people's emotions or facial expressions. Poor social skills.

IN THIS CHAPTER:

- Introduction: Thinking, Language, and Intelligence
- Solving Problems and Making Decisions
- Language and Thought
- Measuring Intelligence
- The Nature of Intelligence
- ENHANCING WELL-BEING WITH PSYCHOLOGY: A Workshop on Creativity



Photo courtesy of Arkansas.com

"Wow," Will exclaimed. "This sounds like Tom!"

The article explained that these characteristics reflected a condition called *Asperger's syndrome,* named after the Austrian pediatrician who first described it. Although related to autism, it was far less disabling, and sometimes called the "geek syndrome" because it seemed to be more common among engineers and computer experts—people who were technologically brilliant but socially inept.

Will and Tom read up on Asperger's syndrome. Eventually, Tom was evaluated by a pediatric neurologist, who formally diagnosed him. Tom was an "Aspie," as he and others with the condition sometimes refer to themselves.

When I asked Tom if he would share his experiences for this Prologue, I knew that conversations with him could be difficult. Tom often doesn't pick up on the verbal and nonverbal "signals" that most people use to regulate their interactions with others. So Tom and I agreed that I would interview him using instant messaging.

Sandy: Tell me how you felt when you were given the diagnosis of Asperger's.

Tom: I felt that I finally had something to pin my weirdness on.

S: How did you feel weird?

T: Because I wasn't "normal" and making friends like the rest of my peers.

T: I mean, I'm not schizoid. . . I get lonely like anyone else.

Sandy: What is it about Asperger's that makes social interaction so difficult?

T: Well, I suppose it's because of a lack of understanding on the part of the person with Asperger's we don't understand some aspects of politeness, for example.

T: Sometimes I don't understand why people would be hurt by something.

It's hard for Aspies to be tactful because they have trouble interpreting other people's emotional state. They don't intend to be rude; they are simply being honest. For example, consider this exchange:

Sandy: I have one more question if that's ok?

Tom: okay. just one?

Sandy: I'm afraid you might be getting bored. See, that's me being polite. ☺

Tom: Well, it's not like I have anything better to do.

As is true for many with Asperger's, Tom's intellectual gifts have helped him compensate for his social deficits. By the end of his freshman year of high school, Tom ranked first in his class of over 800 students. He also scored so highly on the SAT that he was admitted to a special school for gifted students.

Although some of his fellow students envy his intellectual abilities, Tom is well aware of the special challenges he faces. For example, like many with Asperger's syndrome, Tom can get "stuck" on a math problem or writing assignment, reworking it endlessly and unable to complete his homework because it doesn't meet his own standards for perfection.

Sandy: Ok, so here's the last question: You can tell thousands of college students whatever you want to say about Asperger's. What would you say?

T: well, I could try being a smart aleck and say "We're not as smart as the shrinks say we are. Be thankful you're normal."

S: what's to be thankful for?

T: You can turn in work that's less than perfect. You can make friends.

We'll come back to Tom's story as we discuss the different mental abilities involved in thinking, language, and intelligence. We'll also provide more information about autism and Asperger's syndrome. As you'll see, there is more to "intelligence" than just academic ability.

Introduction: Thinking, Language, and Intelligence

KEY THEME

› *Thinking* is a broad term that refers to how we use knowledge to analyze situations, solve problems, and make decisions.

KEY QUESTIONS

› What are some of the basic characteristics of mental images?
› How do we manipulate mental images?
› What are concepts, and how are they formed?

cognition The mental activities involved in acquiring, retaining, and using knowledge.

thinking The manipulation of mental representations of information in order to draw inferences and conclusions.

mental image A mental representation of objects or events that are not physically present.

Cognition is a general term that refers to the mental activities involved in acquiring, retaining, and using knowledge. In previous chapters, we've looked at fundamental cognitive processes such as perception, learning, and memory. These processes are critical in order for us to acquire and retain new knowledge.

In this chapter, we will focus on how we *use* that knowledge to analyze situations, solve problems, make decisions, and use language. As you'll see, such cognitive abilities are widely regarded as key dimensions of *intelligence*—a concept that we will also explore.

The Building Blocks of Thought

Mental Imagery and Concepts

In the most general sense, *thinking* is involved in all conscious mental activity, whether it is acquiring new knowledge, remembering, planning ahead, or daydreaming. More narrowly, we can say that **thinking** involves manipulating mental representations of information in order to draw inferences and conclusions. Thinking, then, involves active mental processes and is often directed toward some goal, purpose, or conclusion.

What exactly is it that we think *with?* Thinking often involves the manipulation of two forms of mental representations: *mental images* and *concepts.* We'll look first at mental images.

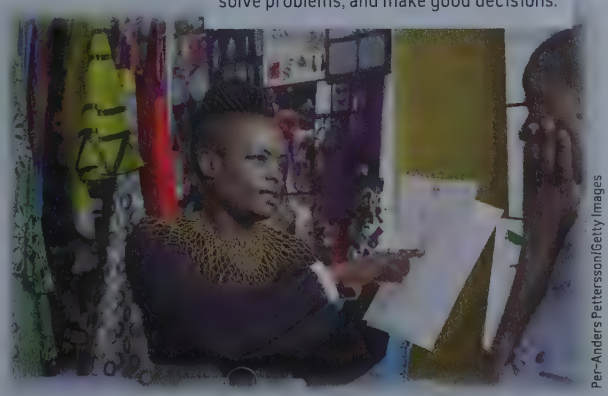
Mental Images

When you read the Prologue, did you form a mental image of the view from the deck of a cabin perched above a river valley? Or of a steep hiking trail, lined with wildflowers and butterflies? Or Sandy and Tom sitting in front of their computers and exchanging instant messages? The stories we tell in our prologues typically lend themselves to the creation of mental images. Formally, a **mental image** is a mental representation of objects or events that are not physically present.

We often rely on mental images to accomplish some cognitive task. For example, try reciting the letters of the alphabet that consist of only curved lines. To accomplish this task, you have to mentally visualize and then inspect an image of each letter of the alphabet.

Typically, the term mental images refers to visual "pictures." However, people can also form mental representations that involve senses other than vision (Cattaneo & Vecchi, 2008; Palmiero & others, 2009). For example, you can probably easily create a mental representation for the taste of a chocolate milk shake, the smell of freshly popped popcorn, or the feel of cold, wet clothing sticking to your skin. Nonetheless, most research on mental images has looked at how we manipulate visual images, and we'll focus on visual images in our discussion here.

Thinking What types of cognitive activities might be required to plan and implement a new clothing line? South African actress and award-winning fashion designer Nkhensani Nkosi, shown here, is highly creative. But she must also be able to draw on existing knowledge, analyze new information, effectively solve problems, and make good decisions.



Per-Anders Pettersson/Getty Images



FIGURE 7.1 Mentally Scanning Images This is a reduced version of the map used by Stephen Kosslyn and his colleagues (1978) to study the scanning of mental images. After subjects memorized the map, the map was removed. Subjects then mentally visualized the map and scanned from one location to another. As you can see by the average scanning times, it took subjects longer to scan greater distances on their mental images of the map, just as it takes longer to scan greater distances on an actual map.

Do people manipulate mental images in the same way that they manipulate their visual images of actual objects? Suppose we gave you a map of the United States and asked you to visually locate San Francisco. Then suppose we asked you to fix your gaze on another city. If the other city was far away from San Francisco (like New York), it would take you longer to visually locate it than if it was close by (like Los Angeles). If you were scanning a *mental* image rather than an actual map, would it also take you longer to scan across a greater distance?

In a classic study by Stephen Kosslyn and his colleagues (1978), participants first viewed and memorized a map of a fictitious island with distinct locations, such as a lake, a hut, a rock, and grass (see Figure 7.1). After the map was removed, participants were asked to imagine a specific location on the island, such as the sandy beach. Then a second location, such as the rock, was named. The participants mentally scanned across their mental image of the map and pushed a button when they reached the rock.

The researchers found that the amount of time it took to mentally scan to the new location was directly related to the distance between the two points. The greater the distance between the two points, the longer it took to scan the mental image of the map (Kosslyn & others, 1978). It seems, then, that we tend to scan a mental image in much the same way that we visually scan an actual image (Kosslyn & Thompson, 2000).

However, we don't simply look at mental images in our minds. Sometimes thinking involves the *manipulation* of mental images. For example, try the problem in Figure 7.2 at the bottom of the page, and then continue reading.

It probably took you longer to determine that the 3 in the middle was backward than to determine that the 3 on the far left was backward. Determining which 3s were backward required you to mentally *rotate* each one to an upright position. Just as it takes time to rotate a physical object, it takes time to mentally rotate an image. Furthermore, the greater the degree of rotation required, the longer it takes you to rotate the image mentally (Wohlschläger & Wohlschläger, 1998). Thus, it probably took you longer to mentally rotate the 3 in the middle, which you had to rotate 180 degrees, than it did to mentally rotate the 3 on the far left, which you had to rotate only 60 degrees.

Collectively, research seems to indicate that we manipulate mental images in much the same way we manipulate the actual objects they represent (Rosenbaum & others, 2001). However, mental images are not perfect duplicates of our actual sensory experience. The mental images we use in thinking have some features in common with actual visual images, but they are not like photographs. Instead, they are *memories* of visual images. And, like other memories, visual images are actively constructed and potentially subject to error (Cattaneo & Vecchi, 2008).

Concepts

Along with mental images, thinking also involves the use of concepts. A **concept** is a mental category we have formed to group objects, events, or situations that share similar features or characteristics. Concepts provide a kind of mental shorthand, economizing the cognitive effort required for thinking and communicating.

Using concepts makes it easier to communicate with others, remember information, and learn new information. For example, the concept "food" might include anything from a sardine to a rutabaga. Although very different, we can still group rutabagas and sardines together because they share the central feature of being edible. If someone introduces us to a new delicacy and tells us it is *food,* we immediately know that it is something to eat—even if it is something we've never seen before.



FIGURE 7.2 Manipulating Mental Images Two of these threes are backward. Which ones?

FOCUS ON NEUROSCIENCE

Seeing Faces and Places in the Mind's Eye

Until the advent of sophisticated brain-scanning techniques, studying mental imagery relied on cognitive tasks, such as measuring how long participants reported it took to scan a mental image (see Kosslyn & others, 2001). Today, however, psychologists are using brain-imaging techniques to study mental imagery. One important issue is whether mental images activate the same brain areas that are involved in perception. Remember, perception takes place when the brain registers information that is received directly from sensory organs.

Previously, researchers have found that perceiving certain types of scenes or objects activates specific brain areas. For example, when we look at *faces*, specific brain areas such as the *fusiform facial area (FFA)* are activated (Pitcher & others, 2011; Epstein & Kanwisher, 1998). When we look at pictures of *places*, a different brain area, called the *parahippocampal place area*, or *PPA*, is activated (Cant & Goodale, 2011; Kanwisher, 2001). Given these findings, the critical question is this: If we simply *imagine* faces or places, will the same brain areas be activated?

To answer that question, psychologists Kathleen O'Craven and Nancy Kanwisher (2000) used functional magnetic resonance imaging (fMRI) to compare brain activity during perception and imagery. Study participants underwent fMRI scans while they looked at photographs of familiar faces and places (scenes from their college campus). Next, the participants were asked to close their eyes and form a vivid mental image of each of the photographs they had just viewed.

Three key findings emerged from the study. First, as you can see from the fMRI scans of two participants shown here, *imagining* a face or place activated the same brain region that is activated when *perceiving* a face or a place. More specifically, forming a mental image of a place activated the parahippocampal place area. And, forming a mental image of a face activated the fusiform facial area.

Second, compared to imagining a face or place, actually perceiving a face or place evoked a stronger brain response, as indicated by the slightly larger red and yellow areas in the perception fMRIs (upper row). Third, because the brain responses between the two conditions were so distinctive, O'Craven and Kanwisher could determine what the participants were imagining—faces or places—simply from looking at the fMRI scans.

Other neuroscientists have confirmed that there is considerable overlap in the brain areas involved in visual perception and mental images (Ganis & others, 2004). Clearly, perception and imagination share common brain mechanisms. So, at least as far as the brain is concerned, "the next best thing to being there" might just be closing your eyes . . . and going there in your mind's eye.



Brain Activation During Perception and Mental Imagery Shown here are the fMRIs of two participants in O'Craven and Kanwisher's (2000) study. Notice that the same brain areas are activated while perceiving or imagining a familiar face. Likewise, the same brain areas are activated while perceiving or imagining a familiar place. Also notice that the brain activation is slightly stronger in the perception condition than in the mental imagery condition.

Adding to the efficiency of our thinking is our tendency to organize the concepts we hold into orderly hierarchies composed of main categories and subcategories (Markman & Gentner, 2001). Thus, a very general concept, such as "furniture," can be mentally divided into a variety of subcategories: tables, chairs, lamps, and so forth. As we learn the key properties that define general concepts, we also learn how members of the concept are related to one another.

How are concepts formed? When we form a concept by learning the *rule* or *features* that define the particular concept, it is called a **formal concept.** Children are taught the specific rules or features that define many simple formal concepts, such as geometric shapes. These defining rules or features can be simple or complex. In either

concept A mental category of objects or ideas based on properties they share.

formal concept A mental category that is formed by learning the rules or features that define it.



Are These Mammals? The more closely an item matches the prototype of a concept, the more quickly we can identify the item as being an example of that concept. Because bats, walruses, and the rather peculiar-looking African long-tailed pangolin don't fit our prototype for a mammal, it takes us longer to decide whether they belong to the category "mammal" than it does to classify animals that are closer to the prototype.

George Steinmetz/Corbis
Michael Krabs/Photolibrary
Kevin Schafer/Minden Pictures

case, the rules are logical but rigid. If the defining features, or *attributes,* are present, then the object is included as a member or example of that concept. For some formal concepts, this rigid all-or-nothing categorization procedure works well. For example, a substance can be categorized as a solid, liquid, or gas. The rules defining these formal concepts are very clear-cut.

However, as psychologist Eleanor Rosch (1973) pointed out, the features that define categories of natural objects and events in everyday life are seldom as clear-cut as the features that define formal concepts. A **natural concept** is a concept formed as a result of everyday experience rather than by logically determining whether an object or event fits a specific set of rules. Rosch suggested that, unlike formal concepts, natural concepts have "fuzzy boundaries." That is, the rules or attributes that define natural concepts are not always sharply defined.

Because natural concepts have fuzzy boundaries, it's often easier to classify some members of natural concepts than others (Rosch & Mervis, 1975). To illustrate this point, think about the defining features or rules that you usually associate with the natural concept "vehicle." With virtually no hesitation, you can say that a car, truck, and bus are all examples of this natural concept. How about a sled? A wheelbarrow? A raft? An elevator? It probably took you a few seconds to determine whether these objects were also vehicles. Why are some members of natural concepts easier to classify than others?

According to Rosch (1978), some members are better representatives of a natural concept than are others. The "best," or most typical, instance of a particular concept is called a **prototype** (Mervis & Rosch, 1981; Rosch, 1978). According to prototype theories of classification, we tend to determine whether an object is an instance of a natural concept by comparing it to the prototype we have developed rather than by logically evaluating whether the defining features are present or absent (Minda & Smith, 2011, 2001).

The more closely an item matches the prototype, the more quickly we can identify it as being an example of that concept (Rosch & Mervis, 1975). For example, it usually takes us longer to identify an olive or a coconut as being a fruit because they are so dissimilar from our prototype of a typical fruit, like an apple or an orange (see Table 7.1).

Some researchers believe that we don't classify a new instance by comparing it to a single "best example" or prototype. Instead, they believe that we store memories of individual instances, called **exemplars,** of a concept (Nosofsky & Zaki, 2002; Voorspoels & others, 2008). Then, when we encounter a new object, we compare it to the exemplars that we have stored in memory to determine whether it belongs to that category (Nosofsky & others, 2011). So, if you're trying to decide whether a coconut is a fruit, you compare it to your memories of other items that you know to be fruits. Is it like an apple? An orange? How about a peach? Or a cantaloupe?

As the two building blocks of thinking, mental images and concepts help us impose order on the phenomena we encounter and think about. We often rely on this knowledge when we engage in complex cognitive tasks, such as solving problems and making decisions, which we'll consider next.

TABLE 7.1

From Prototypes to Atypical Examples

Vehicles	Fruit
car	orange
truck	apple
bus	banana
motorcycle	peach
train	pear
trolley car	apricot
bicycle	plum
airplane	grape
boat	strawberry
tractor	grapefruit
cart	pineapple
wheelchair	blueberry
tank	lemon
raft	watermelon
sled	honeydew
horse	pomegranate
blimp	date
skates	coconut
wheelbarrow	tomato
elevator	olive

Source: Rosch & Mervis (1975).

The first items listed under each general concept are the ones most people tend to think of as the prototype examples of that concept. As you move down the list, the items become progressively less similar to the prototype examples.



Dan Piraro. Reprinted with special permission of King Features Syndicate

Concepts, Exemplars, and Humor What makes this cartoon funny? One source of humor is *incongruity*—the juxtaposition of two concepts, especially when an unexpected similarity between the concepts is revealed (Martin, 2007). Here, the joke relies on the juxtaposition of cats and the familiar exemplar for a barbershop—the striped pole outside the door, plate glass window, and chairs and magazines for clients waiting their turn. Exemplars are often used in cartoons to communicate a situation or concept to the audience. If you didn't share the exemplar for *barbershop*, you probably wouldn't find the joke to be very funny.

Solving Problems and Making Decisions

KEY THEME

› *Problem solving* refers to thinking and behavior directed toward attaining a goal that is not readily available.

KEY QUESTIONS

› What are some advantages and disadvantages of each problem-solving strategy?

› What is insight, and how does intuition work?

› How can functional fixedness and mental set interfere with problem solving?

natural concept A mental category that is formed as a result of everyday experience.

prototype The most typical instance of a particular concept.

exemplars Individual instances of a concept or category, held in memory.

problem solving Thinking and behavior directed toward attaining a goal that is not readily available.

trial and error A problem-solving strategy that involves attempting different solutions and eliminating those that do not work.

From fixing flat tires to figuring out how to pay for college classes, we engage in the cognitive task of problem solving so routinely that we often don't even notice the processes we follow. Formally, **problem solving** refers to thinking and behavior directed toward attaining a goal that is not readily available (Novick & Bassok, 2005).

Before you can solve a problem, you must develop an accurate understanding of the problem. Correctly identifying the problem is a key step in successful problem solving (Bransford & Stein, 1993). If your representation of the problem is flawed, your attempts to solve it will also be flawed.

Problem-Solving Strategies

As a general rule, people tend to attack a problem in an organized or systematic way. Usually, the strategy you select is influenced by the nature of the problem and your degree of experience, familiarity, and knowledge about the problem you are confronting (Chrysikou, 2006). In this section, we'll look at some of the common strategies used in problem solving.

Trial and Error

A Process of Elimination

The strategy of **trial and error** involves actually trying a variety of solutions and eliminating those that don't work. When there is a limited range of possible solutions, trial and error can be a useful problem-solving strategy. If you were trying to develop a new spaghetti sauce recipe, for example, you might use trial and error to fine-tune the seasonings.

When the range of possible answers or solutions is large, however, trial and error can be very time-consuming. For example, our friend Robert typically learns new computer programs by trial and error. Rather than taking 20 minutes to scan the manual or "help" feature, he'll spend hours trying different menu commands to see if he can make the software do what it's supposed to do.

Trial and Error Even an expert chef like Eugenio Gonzalez of the Philippines needs to "adjust the seasonings"—tasting the food before serving to make sure that the flavors are just right. Many new recipes are developed through a process of trial and error.



REUTERS/Cheryl Ravelo

algorithm A problem-solving strategy that involves following a specific rule, procedure, or method that inevitably produces the correct solution.

heuristic A problem-solving strategy that involves following a general rule of thumb to reduce the number of possible solutions.

insight The sudden realization of how a problem can be solved.

intuition Coming to a conclusion or making a judgment without conscious awareness of the thought processes involved.

Algorithms

Guaranteed to Work

Unlike trial and error, an **algorithm** is a procedure or method that, when followed step by step, always produces the correct solution. Mathematical formulas are examples of algorithms. For instance, the formula used to convert temperatures from Celsius to Fahrenheit (multiply *C* by 9/5, then add 32) is an algorithm.

Even though an algorithm may be guaranteed to eventually produce a solution, using an algorithm is not always practical. For example, imagine that while rummaging in a closet you find a combination lock with no combination attached. Using an algorithm will eventually produce the correct combination. You can start with 0–0–0, then try 0–0–1, followed by 0–0–2, and so forth, and systematically work your way through combinations to 36–36–36. But this solution would take a while, because there are 46,656 potential combinations to try. So, although using an algorithm to generate the correct combination for the combination lock is guaranteed to work eventually, it's not a very practical approach to solving this particular problem.



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"Yup, I'm guessing here's your problem."

Heuristics

Rules of Thumb

In contrast to an algorithm, a **heuristic** is a general rule-of-thumb strategy that may or may not work. Although heuristic strategies are not guaranteed to solve a given problem, they tend to simplify problem solving because they let you reduce the number of possible solutions. With a more limited range of solutions, you can use trial and error to eventually arrive at the correct one. In this way, heuristics may serve an adaptive purpose by allowing us to use patterns of information to solve problems quickly and accurately (Gigerenzer & Goldstein, 2011).

Here's an example. Creating footnotes is described somewhere in the onscreen "Help" documentation for a word-processing software program. If you use the algorithm of scrolling through every page of the Help program, you're guaranteed to solve the problem eventually. But you can greatly simplify your task by using the heuristic of entering "footnotes" in the Help program's search box. This strategy does not guarantee success, however, because the search term may not be indexed.

One common heuristic is to break a problem into a series of *subgoals*. This strategy is often used in writing a term paper. Choosing a topic, locating information about the topic, organizing the information, and so on become a series of subproblems. As you solve each subproblem, you move closer to solving the larger problem.

Another useful heuristic involves *working backward* from the goal. Starting with the end point, you determine the steps necessary to reach your final goal. For example, when making a budget, people often start off with the goal of spending no more than a certain total each month, then work backward to determine how much of the target amount they will allot for each category of expenses.



Corbis Cusp/Alamy

Heuristics at Work
Tackling a remodeling job, even a simple one like repainting a room, requires effective problem solving. What heuristics might this young couple use to improve their chances of success?

Perhaps the key to successful problem solving is *flexibility*. A good problem solver is able to recognize that a particular strategy is unlikely to yield a solution—and knows to switch to a different approach (Bilalić & others, 2008). And, sometimes, the reality is that a problem may not have a single "best" solution.

Remember Tom, whose story we told in the prologue? One characteristic of Asperger's syndrome is cognitive rigidity and inflexible thinking (Kleinhans & others, 2005;

Toth & King, 2008). Like Tom, many people can become frustrated when they are "stuck" on a problem. Unlike Tom, most people are able to sense when it's time to switch to a new strategy, take a break for a few hours, seek assistance from experts or others who may be more knowledgeable—or accept defeat and give up. In Tom's case, rather than give up on a problem or seek a different approach to solving it, Tom will persevere in his attempt to solve it. For example, faced with a difficult homework problem in an advanced mathematics class, Tom often stayed up until 2:00 or 3:00 A.M., struggling to solve a single problem until he literally fell asleep at his desk.

Similarly, successful problem solving sometimes involves accepting a less-than-perfect solution to a particular problem—knowing when a solution is "good enough," even if not perfect. But to many with Asperger's syndrome, things are either right or wrong—there is no middle ground (Toth & King, 2008). So when Tom got a 98 rather than 100 on a difficult math test, he was inconsolable. When he ranked in the top five in his class, he was upset because he wasn't first. Tom would sometimes be unable to write an essay because he couldn't think of a perfect opening sentence, or turn in an incomplete essay because he couldn't think of the perfect closing sentence.

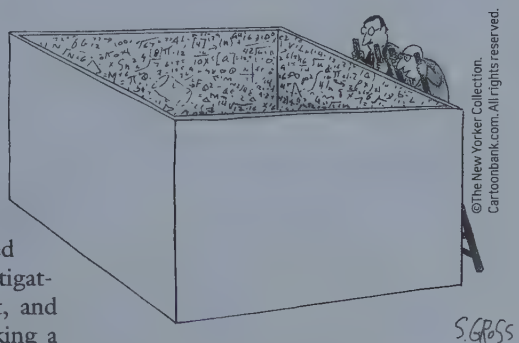

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"Sometimes it's easier if you break the work up into little chunks."

Insight and Intuition

Finally, the solution to some problems seems to arrive in a sudden realization, or flash of **insight,** that happens after you mull a problem over (Ohlsson, 2010; Öllinger & others, 2008). Sometimes an insight will occur when you recognize how the problem is similar to a previously solved problem. Or an insight can involve the sudden realization that an object can be used in a novel way. Try your hand at the two problems in Figure 7.3. The solution to each of those problems is often achieved by insight.

Insights rarely occur through the conscious manipulation of concepts or information. In fact, you're usually not aware of the thought processes that led to an insight. Increasingly, cognitive psychologists and neuroscientists are investigating nonconscious processes, including unconscious problem solving, insight, and intuition (Hogarth, 2010). **Intuition** means coming to a conclusion or making a judgment without conscious awareness of the thought processes involved.



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"Actually, I got some pretty good ideas when I was in the box."

One influential model of intuition is the two-stage model (Bowers & others, 1990; Hodgkinson & others, 2008). In the first stage, called the *guiding stage,* you perceive a pattern in the information you're considering, but not consciously. The perception of such patterns is based on your expertise in a given area and your memories of related information.

In the second stage, the *integrative stage,* a representation of the pattern becomes conscious, usually in the form of a hunch or hypothesis. At this point, conscious analytic thought processes take over. You systematically attempt to prove or disprove the hypothesis. For example, an experienced doctor might integrate both obvious and subtle cues to recognize a pattern in a patient's symptoms, a pattern that takes the form of a hunch or an educated guess. Once the hunch is consciously formulated, she might order lab tests to confirm or disprove her tentative diagnosis.

An intuitive hunch, then, is a new idea that integrates new information with existing knowledge stored in long-term memory. Such hunches are likely to be accurate only in contexts in which you already have a broad base of knowledge and experience (M. Lieberman, 2000; Jones, 2003).

Problem 1	Six drinking glasses are lined up in a row. The first three are full of water, the last three are empty. By handling and moving only one glass, change the arrangement so that no full glass is next to another full one, and no empty glass is next to another empty one.
Problem 2	A man who lived in a small town married 20 different women in that same town. All of them are still living, and he never divorced any of them. Yet he broke no laws. How could he do this?

FIGURE 7.3 A Demonstration of Insightful Solutions The solutions to these problems are often characterized by sudden flashes of insight. See if you have the "That's it!" experience in solving these problems without looking at the solutions on page 285.

Source: Adapted from Ashcraft (1994); problem 2 adapted from Sternberg (1986).

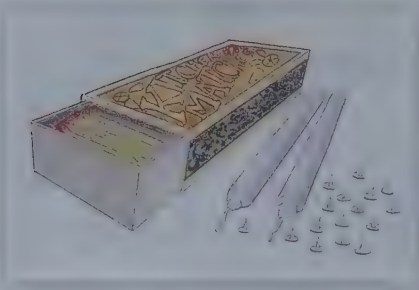


FIGURE 7.4 Overcoming Functional Fixedness Here's a classic problem for you to solve. You have two candles, some thumbtacks, and a box of matches. Using just these objects, try to figure out how to mount the candles on a wall. (The solution is on page 286.)

Source: Adapted from Duncker (1945).

Obstacles to Solving Problems

Thinking Outside the Box

Sometimes, past experience or expertise in a particular domain can actually interfere with effective problem-solving. If we're used to always doing something in a particular way, we may not be open to new or better solutions. When we can't move beyond old, inappropriate heuristics, ideas, or problem-solving strategies, *fixation* can block the generation of new, more effective approaches (Moss & others, 2011; Storm & Angello, 2010).

When we view objects as functioning only in the usual or customary way, we're engaging in a tendency called **functional fixedness**. Functional fixedness often prevents us from seeing the full range of ways in which an object can be used. To get a feel for how functional fixedness can interfere with your ability to find a solution, try the problem in Figure 7.4.

Here's an example of functional fixedness. When pilots fly through clouds, they watch an instrument called an artificial horizon, which shows an outline of an airplane against a horizontal line that represents the horizon. By watching the movement of the outline, they can tell if the aircraft is tilting up or down, or banking to the left or right.

When Don was first learning to fly, he was publicly chastised by a salty old flight instructor for failing to wear a St. Christopher's medal around his neck when flying. Since St. Christopher is the patron saint of travelers, Don assumed that the flight instructor was a bit superstitious. Don's functional fixedness kept him from thinking of any other reason for a pilot to wear a St. Christopher's medal. Finally, Don asked the instructor.

It turned out that a St. Christopher's medal or any other object on a chain can be used to create a makeshift artificial horizon if the flight instrument should fail. You simply drape the chain over the throttle stick. If the aircraft starts pointing down, the medal swings forward; if the aircraft starts pointing upward, the medal swings back. When the aircraft banks, the medal swings to one side or the other. This novel use of an object on a chain could potentially help save the lives of the people in the plane.

Another common obstacle to problem solving is **mental set**—the tendency to persist in solving problems with solutions that have worked in the past (Öllinger & others, 2008). Obviously, if a solution has worked in the past, there's good reason to consider using it again. However, if we approach a problem with a rigid mental set, we may not see other possible solutions (Kershaw & Ohlsson, 2004).

Ironically, mental set is sometimes most likely to block insight in areas in which you are already knowledgeable or well trained. Before you read any further, try solving the simple arithmetic problems in Figure 7.5. If you're having trouble coming up with the answer, it's probably because your existing training in solving arithmetic problems is preventing you from seeing the equations from a different perspective than what you have been taught (Knoblich & Öllinger, 2006; Öllinger & others, 2008).

Mental sets can sometimes suggest a useful heuristic. But they can also prevent us from coming up with new, and possibly more effective, solutions. If we try to be flexible in our thinking and overcome the tendency toward mental sets, we can often identify simpler solutions to many common problems.



FIGURE 7.5 Mental Set The equations on the right, expressed in Roman numerals, are obviously incorrect. Your task is to transform each incorrect equation into a correct equation by moving ONE matchstick in each equation. The matchstick can only be moved once. Only Roman numerals and the three arithmetic operators +, −, or = are allowed. Take your best shot at solving the equations before looking at the solutions on page 289. Remember, in the Roman numeral system, I = 1; II = 2; III = 3; IV = 4; V = 5.

functional fixedness The tendency to view objects as functioning only in their usual or customary way.

mental set The tendency to persist in solving problems with solutions that have worked in the past.

Decision-Making Strategies

KEY THEME

› Different cognitive strategies are used when making decisions, depending on the type and number of options available to us.

KEY QUESTIONS

› What are the single-feature model, the additive model, and the elimination by aspects model of decision making?

› Under what conditions is each strategy most appropriate?

› How do we use the availability and representativeness heuristics to help us estimate the likelihood of an event?

Who hasn't felt like flipping a coin when faced with an important or complicated decision? Fortunately, most of the decisions we make in everyday life are relatively minor. But every now and then we have to make a decision where much more is at stake. When a decision is important or complex, we're more likely to invest time, effort, and other resources in considering different options.

The decision-making process becomes complicated when each option involves the consideration of several features. It's rare that one alternative is superior in every category. So, what do you do when each alternative has pros and cons? In this section, we'll describe three common decision-making strategies.



Frances Roberts/Alamy

Decisions, Decisions There are literally hundreds of different styles, sizes, and colors of jeans at the flagship Old Navy store in Manhattan. What strategies do you use when you buy a new pair of jeans?

The Single-Feature Model

One decision-making strategy is called the *single-feature model.* In order to simplify the choice among many alternatives, you base your decision on a single feature. When the decision is a minor one, the single-feature model can be a good decision-making strategy. For example, faced with an entire supermarket aisle of laundry detergents, you could simplify your decision by deciding to buy the cheapest brand. When a decision is important or complex, however, making decisions on the basis of a single feature can increase the riskiness of the decision.

The Additive Model

A better strategy for complex decisions is to systematically evaluate the important features of each alternative. One such decision-making model is called the *additive model.*

In this model, you first generate a list of the factors that are most important to you. Then, you rate each alternative for each factor using an arbitrary scale, such as from −5 to +5. If a particular factor has strong advantages or appeal, you give it the maximum rating (+5). If a particular factor has strong drawbacks or disadvantages, you give it the minimum rating (−5). Finally, you add up the ratings for each alternative. This strategy can often reveal the best overall choice. If the decision involves a situation in which some factors are more important than others, you can emphasize the more important factors by multiplying the rating.

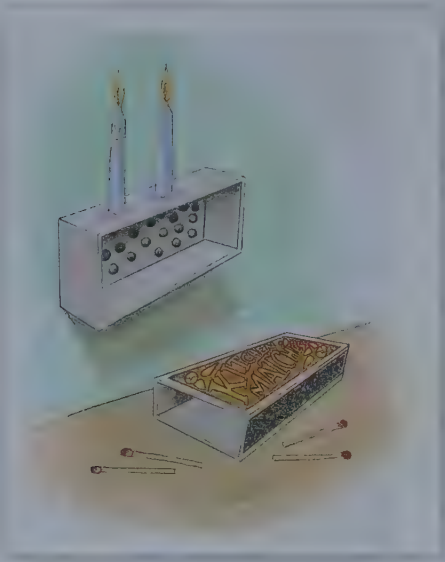
Taking the time to apply the additive model to important decisions can greatly improve your decision making. By allowing you to evaluate the features of one alternative at a time, then comparing the alternatives, the additive model provides a logical strategy for identifying the most acceptable choice from a range of possible decisions. Although we seldom formally calculate the subjective value of individual features for different options, we often informally use the additive model by comparing two choices feature by feature. The alternative with the "best" collection of features is then selected.

The Elimination by Aspects Model

Psychologist Amos Tversky (1972) proposed another decision-making model called the *elimination by aspects model.* Using this model, you evaluate all the alternatives one characteristic at a time, typically starting with the feature you consider most important.

Problem 1	Pour the water in glass number 2 into glass number 5.
Problem 2	The man is a minister.

Solutions to the Problems in Figure 7.3



Solution to Figure 7.4

If a particular alternative fails to meet that criterion, you scratch it off your list of possible choices, even if it possesses other desirable attributes. As the range of possible choices is narrowed down, you continue to compare the remaining alternatives, one feature at a time, until just one alternative is left.

For example, suppose you want to buy a new computer. You might initially eliminate all the models that aren't powerful enough to run the software you need to use, then the models outside your budget, and so forth. Continuing in this fashion, you would progressively narrow down the range of possible choices to the one choice that satisfies all your criteria.

Good decision makers adapt their strategy to the demands of the specific situation. If there are just a few choices and features to compare, people tend to use the additive method, at least informally. However, when the decision is complex, involving the comparison of many choices that have multiple features, people often use *more than one* strategy. That is, we usually begin by focusing on the critical features, using the elimination by aspects strategy to quickly narrow down the range of acceptable choices. Once we have narrowed the list of choices down to a more manageable short list, we tend to use the additive model to make a final decision.

Decisions Involving Uncertainty

Estimating the Probability of Events

Some decisions involve a high degree of uncertainty. In these cases, you need to make a decision, but you are unable to predict with certainty that a given event will occur. Instead, you have to estimate the probability of an event occurring. But how do you actually make that estimation?

For example, imagine that you're running late for a very important appointment. You may be faced with this decision: "Should I risk a speeding ticket to get to the appointment on time?" In this case, you would have to estimate the probability of a particular event occurring—getting pulled over for speeding.

In such instances, we often estimate the likelihood that certain events will occur, then gamble. In deciding what the odds are that a particular gamble will go our way, we tend to rely on two rule-of-thumb strategies to help us estimate the likelihood of events: the *availability heuristic* and the *representativeness heuristic* (Tversky & Kahneman, 1982; Kahneman, 2003).

Vivid Images and the Availability Heuristic: Shark! Almost every summer, shark attacks make the headlines in newspapers and online. But how likely are you to die in a shark attack? In 2010, there were *two* deaths due to shark attack. In contrast, 33 people were killed by dog attacks, 29 people were killed by lightning—and 630 people were killed in bicycle accidents. How does the availability heuristic explain why people are afraid to go to the beach after a well-publicized shark sighting?

Source: International Shark Attack File (2010).



Watt Jim/Photolibrary

The Availability Heuristic

When we use the **availability heuristic,** we estimate the likelihood of an event on the basis of how readily available other instances of the event are in our memory. When instances of an event are easily recalled, we tend to consider the event as being more likely to occur. So, we're less likely to exceed the speed limit if we can readily recall that a friend recently got a speeding ticket.

However, when a rare event makes a vivid impression on us, we may overestimate its likelihood (Tversky & Kahneman, 1982). State lottery commissions capitalize on this cognitive tendency by running many TV commercials showing that lucky person who won the $100 million Powerball. A vivid memory is created, which leads viewers to an inaccurate estimate of the likelihood that the event will happen to them.

The key point here is that the less accurately our memory of an event reflects the actual frequency of the event, the less accurate our estimate of the event's likelihood will be. That's why the lottery commercials don't show the other 50 million people staring dejectedly at their TV screens because they did *not* win the $100 million.

The Representativeness Heuristic

availability heuristic A strategy in which the likelihood of an event is estimated on the basis of how readily available other instances of the event are in memory.

representativeness heuristic A strategy in which the likelihood of an event is estimated by comparing how similar it is to the prototype of the event.

The other heuristic we often use to make estimates is called the **representativeness heuristic** (Kahneman & Tversky, 1982; Kahneman, 2003). Here, we estimate an event's likelihood by comparing how similar its essential features are to our prototype of the event. Remember, a *prototype* is the most typical example of an object or an event.

To go back to our example of deciding whether to speed, we are more likely to risk speeding if we think that we're somehow significantly different from the prototype of the driver who gets a speeding ticket. If our prototype of a speeder is a teenager driving a flashy, high-performance car, and we're an adult driving a minivan with a baby seat, then we will probably estimate the likelihood of our getting a speeding ticket as low.

Like the availability heuristic, the representativeness heuristic can lead to inaccurate judgments. Consider the following description:

> Maria is a perceptive, sensitive, introspective woman. She is very articulate, but measures her words carefully. Once she's certain she knows what she wants to say, she expresses herself easily and confidently. She has a strong preference for working alone.

On the basis of this description, is it more likely that Maria is a successful fiction writer or that Maria is a registered nurse? Most people guess that she is a successful fiction writer. Why? Because the description seems to mesh with what many people think of as the typical characteristics of a writer.

However, when you compare the number of registered nurses (which is very large) to the number of successful female fiction writers (which is very small), it's actually much more likely that Maria is a nurse. Thus, the representativeness heuristic can produce faulty estimates if (1) we fail to consider possible variations from the prototype or (2) we fail to consider the approximate number of prototypes that actually exist.

What determines which heuristic is more likely to be used? Research suggests that the availability heuristic is most likely to be used when people rely on information held in their long-term memory to determine the likelihood of events occurring. On the other hand, the representativeness heuristic is more likely to be used when people compare different variables to make predictions (Harvey, 2007).

The Critical Thinking box "The Persistence of Unwarranted Beliefs" on the next page discusses some of the other psychological factors that can influence the way in which we evaluate evidence, make decisions, and draw conclusions.

CONCEPT REVIEW 7.1

Problem-Solving and Decision-Making Strategies

Identify the strategy used in each of the following examples. Choose from: trial and error, algorithm, heuristic, insight, representativeness heuristic, availability heuristic, and single-feature model.

_____ 1. As you try to spell the word deceive, you recite "i before e except after c."

_____ 2. You are asked to complete the following sequence: O, T, T, F, F, _____, _____, _____, _____, _____. You suddenly realize that the answer is obvious: S, S, E, N, T.

_____ 3. One by one, Professor Goldstein tries each key on the key chain until she finds the one that opens the locked filing cabinet.

_____ 4. Laura is trying to construct a house out of LEGO building blocks. She tries blocks of different shapes until she finds one that fits.

_____ 5. After seeing news reports about a teenager being killed in a freak accident on a roller coaster, Angela refuses to allow her son to go to an amusement park with his friends.

_____ 6. Jacob decided to rent an apartment at the apartment complex that was closest to his college campus.

_____ 7. Jack, who works as a bank teller, is stunned when a well-dressed, elderly woman pulls out a gun and tells him to hand over all the money in his cash drawer.

CRITICAL THINKING

The Persistence of Unwarranted Beliefs

Throughout this text, we show how many pseudoscientific claims fail when subjected to scientific scrutiny. However, once a belief in a pseudoscience or paranormal phenomenon is established, the presentation of contradictory evidence often has little impact (Lester, 2000). Ironically, contradictory evidence can actually *strengthen* a person's established beliefs (Lord & others, 1979). How do psychologists account for this?

Several psychological studies have explored how people deal with evidence, especially evidence that contradicts their beliefs (see Ross & Anderson, 1982; Zusne & Jones, 1989). The four obstacles to logical thinking described here can account for much of the persistence of unwarranted beliefs in pseudosciences or other areas (Risen & Gilovich, 2007).

Obstacle 1: The Belief-Bias Effect

The *belief-bias effect* occurs when people accept only the evidence that conforms to their belief, rejecting or ignoring any evidence that does not. For example, in a classic study conducted by Warren Jones and Dan Russell (1980), ESP believers and ESP disbelievers watched two attempts at telepathic communication. In each attempt, a "receiver" tried to indicate what card the "sender" was holding.

In reality, both attempts were rigged. One attempt was designed to appear to be a successful demonstration of telepathy, with a significant number of accurate responses. The other attempt was designed to convincingly demonstrate failure. In this case, the number of accurate guesses was no more than chance and could be produced by simple random guessing.

Following the demonstration, the participants were asked what they believed had taken place. Both believers and disbelievers indicated that ESP had occurred in the successful attempt. But only the believers said that ESP had also taken place in the clearly *unsuccessful* attempt. In other words, the ESP believers ignored or discounted the evidence in the failed attempt. This is the essence of the belief-bias effect.

Obstacle 2: Confirmation Bias

Confirmation bias is the strong tendency to search for information or evidence that confirms a belief, while making little or no effort to search for information that might disprove the belief (Gilovich, 1997; Masnick & Zimmerman, 2009). For example, we tend to visit Web sites that support our own viewpoints and read blogs and editorial columns written by people who interpret events from our perspective. At the same time, we avoid the Web sites, blogs, and columns written by people who don't see things our way (Ruscio, 1998).

People also tend to believe evidence that confirms what they *want* to believe is true, a bias that is sometimes called the *wishful thinking bias* (Bastardi & others, 2011). Faced with evidence that seems to contradict a hoped-for finding, people may object to the study's methodology. And, evaluating evidence that seems to confirm a wished-for finding, people may overlook flaws in the research or argument. For example, parents with children in day care may be motivated to embrace research findings that emphasize the benefits of day care for young children and discount findings that emphasize the benefits of home-based care.

Obstacle 3: The Fallacy of Positive Instances

The *fallacy of positive instances* is the tendency to remember uncommon events that seem to confirm our beliefs and to forget events that disconfirm our beliefs. Often, the occurrence is really nothing more than coincidence. For example, you find yourself thinking of an old friend. A few moments later, the phone rings and it's him. You remember this seemingly telepathic event, but forget all the times that you've thought of your old friend and he did not call. In other words, you remember the positive instance but fail to notice the negative instances when the anticipated event did not occur (Gilovich, 1997).



"What's nice about working in this place is we don't have to finish any of our experiments."

Obstacle 4: The Overestimation Effect

The tendency to overestimate the rarity of events is referred to as the *overestimation effect.* Suppose a "psychic" comes to your class of 23 students. Using his psychic abilities, the visitor "senses" that two people in the class were born on the same day. A quick survey finds that, indeed, two people share the same month and day of birth. This is pretty impressive evidence of clairvoyance, right? After all, what are the odds that two people in a class of 23 would have the same birthday?

When we perform this "psychic" demonstration in class, our students usually estimate that it is very unlikely that 2 people in a class of 23 will share a birthday. In reality, the odds are *1 in 2*, or 50–50 (Martin, 1998). Our students' overestimation of the rarity of this event is an example of the *overestimation effect.*

Thinking Critically About the Evidence

On the one hand, it is important to keep an open mind. Simply dismissing an idea as impossible shuts out the consideration of evidence for new and potentially promising ideas or phenomena. At one time, for example, scientists thought it impossible that rocks could fall from the sky (Hines, 2003).

On the other hand, the obstacles described here underscore the importance of choosing ways to gather and think about evidence that will help us avoid unwarranted beliefs and self-deception.

The critical thinking skills we described in Chapter 1 are especially useful in this respect. Boxes "What Is Critical Thinking?" and "What Is a Pseudoscience?" provided guidelines that can be used to evaluate all claims, including pseudoscientific or paranormal claims. In particular, it's important to stress again that good critical thinkers strive to evaluate *all* the available evidence before reaching a conclusion, not just the evidence that supports what they want to believe.

CRITICAL THINKING QUESTIONS

- How can using critical thinking skills help you avoid these obstacles to logical thinking?
- Beyond the logical fallacies described here, what might motivate people to maintain beliefs in the face of contradictory evidence?

Language and Thought

KEY THEME

› Language is a system for combining arbitrary symbols to produce an infinite number of meaningful statements.

KEY QUESTIONS

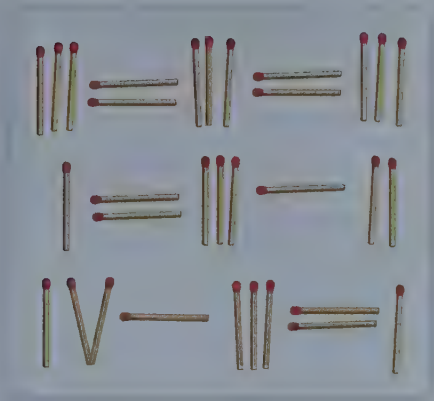
› What are the characteristics of language?

› How does language affect thinking?

› How have nonhuman animals been shown to use language?

The human capacity for language is surely one of the most remarkable of all our cognitive abilities. With little effort, you produce hundreds of new sentences every day. And you're able to understand the vast majority of the thousands of words contained in this chapter without consulting a dictionary.

Human language has many special qualities—qualities that make it flexible, versatile, and complex. **Language** can be formally defined as a system for combining arbitrary symbols to produce an infinite number of meaningful statements. We'll begin our discussion of the relationship between language and thought by describing these special characteristics of language. In Chapter 9, we'll discuss language development in children.



Solution to Figure 7.5 Most people try to correct the equations in Figure 7.5 by moving a matchstick that changes one of the numbers. Why? Because solving the math problems that we are assigned in school almost always involves manipulating the numbers, not the arithmetic signs. While this assumption is a useful one in solving the vast majority of math problems—especially the ones that you are assigned as homework—it is an example of a mental set that can block you from arriving at new, creative solutions to problems.

The Characteristics of Language

The purpose of language is to communicate—to express meaningful information in a way that can be understood by others. To do so, language requires the use of *symbols*. These symbols may be sounds, written words, or, as in American Sign Language, formalized gestures.

A few symbols may be similar in form to the meaning they signify, such as the English words *boom* and *pop*. However, for most words, the connection between the symbol and the meaning is completely *arbitrary* (Pinker, 1995, 2007). For example, *ton* is a small word that stands for a vast quantity, whereas *nanogram* is a large word that stands for a very small quantity. Because the relationship between the symbol and its meaning is arbitrary, language is tremendously flexible (Pinker, 1994, 2007). New words can be invented, such as *podcast, metrosexual,* and *bling*. And the meanings of words can change and evolve, such as *gay, stock market,* and *hookup*.

The meaning of these symbols is *shared* by others who speak the same language. That is, speakers of the same language agree on the connection between the sound and what it symbolizes. Consequently, a foreign language sounds like a stream of meaningless sounds because we do not share the memory of the connection between the arbitrary sounds and the concrete meanings they symbolize.

> The word duck does not look like a duck, walk like a duck, or quack like a duck, but refers to a duck all the same, because the members of a language community, as children, all memorized the pairing [between a sound and a meaning].
>
> *Steven Pinker (1995)*



Jack Kurtz/The Image Works

American Sign Language American Sign Language, used by hearing-impaired people, meets all the formal requirements for language, including syntax, displacement, and generativity. The similarities between spoken language and sign language have been confirmed by brain-imaging studies. The same brain regions are activated in hearing people when they speak as in deaf people when they use sign language (Hickok & others, 2001; Lubbadeh, 2005).

language A system for combining arbitrary symbols to produce an infinite number of meaningful statements.

Giving Birth to a New Language In 1977, a special school for deaf children opened in Managua, Nicaragua. The children quickly developed a system of gestures for communicating with one another. Over the past 30 years, the system of gestures has evolved into a unique new language with its own grammar and syntax—*Idioma de Signos Nicaragense* (Senghas & others, 2004; Siegal, 2004). The birth of Nicaraguan Sign Language is not a unique event. Recently, linguists Wendy Sandler and her colleagues (2006) at the University of Haifa documented the spontaneous development of another unique sign language, this one in a remote Bedouin village where a large number of villagers share a form of hereditary deafness (Fox, 2008). Like Nicaraguan Sign Language, *Al-Sayyid Bedouin Sign Language* has its own syntax and grammatical rules, which differ from other languages in the region. The spontaneous evolution of these two unique sign languages vividly demonstrates the human predisposition to develop rule-based systems of communication (Fox, 2008).



Oswaldo Rivas/Reuters/Corbis



Sign Language Research Lab, University of Haifa.

Further, language is a highly structured system that follows specific rules. Every language has its own unique *syntax*, or set of rules for combining words. Although you're usually unaware of these rules as you're speaking or writing, you immediately notice when a rule has been violated.

The rules of language help determine the meaning that is being communicated. For example, word-order rules are very important in determining the meaning of an English phrase. "The boy ate the giant pumpkin" has an entirely different meaning from "The giant pumpkin ate the boy." In other languages, meaning may be conveyed by different rule-based distinctions, such as specific pronouns, the class or category of words, or word endings.

CULTURE AND HUMAN BEHAVIOR

The Effect of Language on Perception

Professionally, Benjamin Whorf (1897–1941) was an insurance company inspector. But his passion was the study of languages, particularly Native American languages. In the 1950s, Whorf proposed an intriguing theory that became known as the *Whorfian hypothesis*.

Whorf (1956) believed that a person's language determines the very structure of his or her thought and perception. Your language, he claimed, determines how you perceive and "carve up" the phenomena of your world. He argued that people who speak very different languages have completely different worldviews. More formally, the Whorfian hypothesis is called the **linguistic relativity hypothesis**—the notion that differences among languages cause differences in the thoughts of their speakers.

To illustrate his hypothesis, Whorf contended that the Eskimos had many different words for "snow." But English, he pointed out, has only the word *snow*. According to Whorf (1956):

> We have the same word for falling snow, snow on the ground, snow packed hard like ice, slushy snow, wind-driven flying snow—whatever the situation may be. To an Eskimo, this all-inclusive word would be almost unthinkable; he would say that falling snow, slushy snow, and so on are sensuously and operationally different, different things to contend with; he uses different words for them and for other kinds of snow.

Whorf's example would be compelling except for one problem: The Eskimos do *not* have dozens of different words for "snow." Rather, they have just a few words for "snow" (Pinker, 2007). Beyond that minor sticking point, think carefully about Whorf's example. Is it really true that English-speaking people have a limited capacity to describe snow? Or do not discriminate between different types of snow? The English language includes *snowflake, snowfall, slush, sleet, flurry, blizzard,* and *avalanche*. Avid skiers have many additional words to describe snow, from *powder* to *mogul* to *hardpack*.

More generally, people with expertise in a particular area tend to perceive and make finer distinctions than nonexperts do. Experts are also more likely to know the specialized terms that reflect those distinctions (Pinker, 1994, 2007). To the knowledgeable birdwatcher, for example, there are distinct differences between a cedar waxwing and a bohemian waxwing. To the nonexpert, they're just two brownish birds with yellow tail feathers.

Despite expert/nonexpert differences in noticing and naming details, we don't claim that the expert "sees" a different reality than a nonexpert. In other words, our perceptions and thought processes influence the language we use to describe those perceptions (Rosch, 1987; Pinker, 2007). Notice that this conclusion is the exact *opposite* of the linguistic relativity hypothesis.

Whorf also pointed out that many languages have different color-naming systems. English has names for 11 basic colors: *black, white, red, green, yellow, blue, brown, purple, pink, orange,* and *gray*. However, some languages have only a few color terms. Navajo, for example, has only one word to describe both blue and green, but two different words for black (Fishman, 1960). Would people who had just a few words for colors "carve up" and perceive the electromagnetic spectrum differently?

Eleanor Rosch set out to answer this question (Heider & Olivier, 1972). The Dani-speaking people of New Guinea have words for only two colors. *Mili* is used for the dark, cool colors of black, green, and blue. *Mola* is used for light, warm colors, such as white, red, and yellow. According to the Whorfian hypothesis, the people of New Guinea, with names for only two classes of colors, should perceive

Another important characteristic of language is that it is creative, or *generative*. That is, you can generate an infinite number of new and different phrases and sentences.

A final important characteristic of human language is called *displacement*. You can communicate meaningfully about ideas, objects, and activities that are not physically present. You can refer to activities that will take place in the future, that took place in the past, or that will take place only if certain conditions are met ("If you get that promotion, maybe we can afford a new car"). You can also carry on a vivid conversation about abstract ideas ("What is justice?") or strictly imaginary topics ("If you were going to spend a year in a space station orbiting Neptune, what would you bring along?").

linguistic relativity hypothesis The hypothesis that differences among languages cause differences in the thoughts of their speakers.

How Language Influences Thinking

All your cognitive abilities are involved in understanding and producing language. Using learning and memory, you acquire and remember the meaning of words. You interpret the words you hear or read (or see, in the case of American Sign Language) through the use of perception. You use language to help you reason, represent and solve problems, and make decisions (Polk & Newell, 1995).

Language can influence thinking in several ways. For example, when you hear about a course titled "Man and His Environment," what image comes to mind? Do you visualize a group of men tromping through the forest, or do you imagine a mixed group of men and women?

The word *man* and the pronouns *he* and *his* can refer to either a male or a female in English because English has no gender-neutral pronoun. So, according to the rules of the English language, the course title "Man and His Environment" technically refers to both men and women.



©Edward Gibson, MIT Brain and Cognitive Sciences

Can You Count Without Number Words? Cognitive neuroscientist Edward Gibson traveled to a remote Amazon village to confirm previous research by anthropologist and linguist David Everett (2008, 2005) that showed the Pirahã people lacked the ability to count and had no comprehension of numbers. Gibson found that rather than identifying quantities by exact numbers, the Pirahã research participants used only relative terms like "few," "some," and "many." According to Gibson, the Pirahã are capable of learning to count, but did not develop a number system because numbers are simply not useful in their culture (Frank & others, 2008).

color differently than English-speaking people, with names for 11 basic colors.

Rosch showed Dani speakers a brightly colored chip and then, 30 seconds later, asked them to pick out the color they had seen from an array of other colors. Despite their lack of specific words for the colors they had seen, the Dani did as well as English speakers on the test. The Dani people used the same word to label red and yellow, but they still distinguished between the two. Rosch concluded that the Dani people perceived colors in much the same way as English-speaking people.

Other research on color-naming in different languages has arrived at similar conclusions: Although color *names* may vary, color *perception* does not appear to depend on the language used (Lindsey & Brown, 2004; Delgado, 2004; Kay & Regier, 2007).

The bottom line? Whorf's strong contention that language *determines* perception and the structure of thought has not been supported. However, cultural and cognitive psychologists today are actively investigating the ways in which language can *influence* perception and thought (Frank & others, 2008; Majid & others, 2004).

A striking demonstration of the influence of language comes from recent studies of remote indigenous peoples living in the Amazon region of Brazil (Everett, 2005, 2008). The language of the Pirahã people, an isolated tribe of fewer than 200 members, has no words for specific numbers (Frank & others, 2008). Their number words appear to be restricted to words that stand for "few," "more," and "many" rather than exact quantities such as "three," "five," or "twenty." Similarly, the Mundurukú language, spoken by another small Amazon tribe, has words only for quantities one through five (Pica & others, 2004). Above that number, they used such expressions as "some," "many," or "a small quantity." In both cases, individuals were unable to complete simple arithmetical tasks (Gordon, 2004).

Such findings do not, by any means, confirm Whorf's belief that language *determines* thinking or perception (Deutscher, 2010; Gelman & Gallistel, 2004). Rather, they demonstrate how language categories can affect *how* individuals think about particular concepts.

However, several studies have shown that using the masculine pronoun tends to produce images of males and exclude females (Beasley, 2007; Miller & James, 2009). In a classic study by Nancy Henley (1989), participants were given identical sentence fragments to complete. Examples included "If a writer expects to get a book published . . ." and "If an employee wants a raise . . ." Participants in the first group were given the masculine generic *he* to use in finishing the sentences. Participants in the second group were given either *they* or *he or she* to use in completing the sentences.

After completing the sentences, the subjects were asked to describe their mental imagery for each sentence and to provide a first name for the person they visualized. When the word *he* was used, subjects were much more likely to produce a male image and name than a female image and name. When the phrase *he or she* was used, subjects were only slightly more likely to use a male rather than a female image and name.

Using the masculine generic pronoun influences people to visualize a male, even when they "know" that *he* supposedly includes both men and women (Smith & others, 2010; Hamilton, 1988). Thus, using *he* to refer to both men and women in speech and writing tends to increase male bias.

Animal Communication and Cognition

Chimpanzees "chutter" to warn of snakes and "chirp" to let others know that a leopard is nearby. Prairie dogs make different sounds to warn of approaching coyotes, dogs, hawks, and even humans wearing blue shirts versus humans wearing yellow shirts (Slobodchikoff & others, 2009). Even insects have complex communication systems. For example, honeybees perform a "dance" to report information about the distance, location, and quality of a pollen source to their hive mates (Riley & others, 2005).

Clearly, animals communicate with one another, but are they capable of mastering language? Some of the most promising results have come from the research of psychologists Sue Savage-Rumbaugh and Duane Rumbaugh (Lyn & others, 2006). These researchers began working with a rare chimpanzee species called the *bonobo* in the mid-1980s (Savage-Rumbaugh & Lewin, 1994).

The bonobo Kanzi was able to learn symbols and also to comprehend spoken English. Altogether, Kanzi understands elementary syntax and more than 500 spoken English words. And, Kanzi can respond to new, complex spoken commands, such as "Put the ball on the pine needles" (Segerdahl & others, 2006). Because these commands are spoken by an assistant out of Kanzi's view, he cannot be responding to nonverbal cues.

Research evidence suggests that nonprimates also can acquire limited aspects of language. For example, Louis Herman and his coworkers (1993, 2002) have trained bottlenosed dolphins to respond to sounds and gestures, each of which stands for a word. This artificial language incorporates syntax rules, such as those that govern word order.

Finally, consider Alex, an African gray parrot. Trained by Irene Pepperberg (1993, 2000), Alex could answer spoken questions with spoken words and identify and categorize objects by color, shape and material (Pepperberg, 2007). Alex also used many simple phrases, such as "Come here" and "Want to go back."



Chuck Haney/DanitaDelimont.com

Prairie Dogs Prairie dogs use a sophisticated system of vocal communication to describe predators. Their high-pitched calls contain specific information about what the predator is, how big it is, and how fast it is approaching (Slobodchikoff & others, 2009).



©Arlene Levin-Rowe

Irene Pepperberg with Alex When Alex died suddenly in September 2007, the story was reported in newspapers around the world, including the *New York Times* (Carey, 2007; Talbot, 2008). Over 30 years of research, Pepperberg and Alex revolutionized ideas about avian intelligence and animal communication. Along with his remarkable language abilities, Alex also displayed an understanding of simple concepts, including an understanding of bigger and smaller, similarity and difference. Shown a green block and a green ball and asked "What's the same?" Alex responds, "Color." Alex could even accurately label quantities up to the number six (Pepperberg, 2007). To learn more about Pepperberg's ongoing research with gray parrots Griffin and Arthur, visit www.alexfoundation.org.

Going beyond language, psychologists today study many aspects of animal behavior, including memory, problem solving, planning, cooperation, and even deception. Collectively, such research reflects an active area of psychological research that is referred to as **animal cognition** or **comparative cognition** (Shettleworth, 2010; Wasserman & Zentall, 2006).

And, rather than focusing on whether nonhuman animals can develop human capabilities, such as language, comparative psychologists today study a wide range of cognitive abilities in many different species (Emery & Clayton, 2009; Shettleworth, 2010). For example:

- Western scrub jays can, apparently, remember the past and anticipate the future (Clayton & others, 2003). They survive harsh winters by remembering precisely where they stored the food they gathered months earlier. Displaying planning and foresight, they can determine where to store food so that it will be available when needed in the future (Raby & others, 2007; van der Vaart & others, 2011).
- Western scrub jays who have stolen food stored by other jays are more careful about hiding their own food, implying that they are able to understand the intentions of others (Dally & others, 2010).
- Black-capped chickadees are able to remember the outcome of a foraging expedition and use that memory to prospectively plan where to seek food in the future (Feeney & others, 2011).
- Pinyon jays can use logic to determine the social status of other birds by watching how a stranger bird interacts with birds whose social status is already known to them (Paz-y-Miño & others, 2004).
- Bengalese finches detect differences in the "syntax" of different bird calls, noticing when the sequencing of phrases differs from songs previously heard (Abe & Watanabe, 2011; Bloomfield & others, 2011).
- Elephants, highly social animals, seem to understand the nature of cooperation, as reflected in their ability to coordinate their efforts with other elephants in order to reach a food reward (Plotnik & others, 2011).

Can nonhuman animals "think"? Do they consciously reason? Such questions may be unanswerable (Premack, 2007). More important, many comparative psychologists today take a different approach. Rather than trying to determine whether animals can reason, think, or communicate like humans, these researchers are interested in the specific cognitive capabilities that different species have evolved to best adapt to their ecological niche (de Waal & Ferrari, 2010; Shettleworth, 2010).



Joshua Plotnik and Richard Lair

Lending a Trunk In this experiment, Asian elephants had to pull two ends of the same rope simultaneously to drag a bucket of tasty corn within reach. Researchers found that the elephants quickly learned to coordinate their efforts, and would wait at their rope end as long as 45 seconds for an elephant partner. They also appeared to understand that there was no point to pulling if the partner lacked access to the rope (Plotnik & others, 2011).

Measuring Intelligence

KEY THEME

› *Intelligence* is defined as the global capacity to think rationally, act purposefully, and deal effectively with the environment.

KEY QUESTIONS

› What roles did Binet, Terman, and Wechsler play in the development of intelligence tests?

› How did Binet, Terman, and Wechsler differ in their beliefs about intelligence and its measurement?

› Why are standardization, validity, and reliability important components of psychological tests?

Up to this point, we have talked about a broad range of cognitive abilities—the use of mental images and concepts, problem solving and decision making, and the use of language. All these mental abilities are aspects of what we commonly call *intelligence*.

animal cognition or **comparative cognition** The study of animal learning, memory, thinking, and language.



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"I don't have to be smart, because someday I'll just hire lots of smart people to work for me."

What exactly is intelligence? We will rely on a formal definition developed by psychologist David Wechsler. Wechsler (1944, 1977) defined **intelligence** as the global capacity to think rationally, act purposefully, and deal effectively with the environment. Although many people commonly equate intelligence with "book smarts," notice that Wechsler's definition is much broader. To Wechsler, intelligence is reflected in effective, rational, and goal-directed behavior.

The Development of Intelligence Tests

Can intelligence be measured? If so, how? Intelligence tests attempt to measure general mental abilities, rather than accumulated knowledge or aptitude for a specific subject or area. In the next several sections, we will describe the evolution of intelligence tests, including the qualities that make any psychological test scientifically acceptable.

Alfred Binet

Identifying Students Who Needed Special Help

In the early 1900s, the French government passed a law requiring all children to attend school. Faced with the need to educate children from a wide variety of backgrounds, the French government commissioned psychologist **Alfred Binet** to develop procedures to identify students who might require special help.

With the help of French psychiatrist Théodore Simon, Binet devised a series of tests to measure different mental abilities. Binet deliberately did not test abilities, such as reading or mathematics, that the students might have been taught. Instead, he focused on elementary mental abilities, such as memory, attention, and the ability to understand similarities and differences.

To judge well, to comprehend well, to reason well, these are the essential activities of intelligence.

Alfred Binet and Théodore Simon (1905)

Binet arranged the questions on his test in order of difficulty, with the simplest tasks first. He found that brighter children performed like older children. That is, a bright 7-year-old might be able to answer the same number of questions as an average 9-year-old, while a less capable 7-year-old might do only as well as an average 5-year-old.

This observation led Binet to the idea of a mental level, or **mental age,** that was different from a child's chronological age. An "advanced" 7-year-old might have a mental age of 9, while a "slow" 7-year-old might demonstrate a mental age of 5.

It is somewhat ironic that Binet's early tests became the basis for modern intelligence tests. First, Binet did *not* believe that he was measuring an inborn or permanent level of intelligence (Foschi & Cicciola, 2006; Kamin, 1995). Rather, he believed that his tests could help identify "slow" children who could benefit from special help (Newton & McGrew, 2010).



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Alfred Binet French psychologist Alfred Binet (1857–1911) is shown here with an unidentified child and an instrument from his laboratory that was used to measure his young subjects' breathing rates while they performed different tasks (Cunningham, 1997). Although Binet developed the first systematic intelligence tests, he did not believe that he was measuring innate ability. Instead, he believed that his tests could identify schoolchildren who could benefit from special help.

Second, Binet believed that intelligence was too complex a quality to describe with a single number (Siegler, 1992). He steadfastly refused to rank "normal" children on the basis of their scores, believing that such rankings would be unfair. He recognized that many individual factors, such as a child's level of motivation, might affect the child's score. Finally, Binet noted that an individual's score could vary from time to time (Gould, 1993; Kaufman, 2009).

Lewis Terman and the Stanford-Binet Intelligence Test

There was enormous interest in Binet's test in the United States. The test was translated and adapted by Stanford University psychologist **Lewis Terman.** Terman's revision was called the *Stanford-Binet Intelligence Scale.* First published in 1916, the Stanford-Binet was for many years the standard for intelligence tests in the United States.

Terman adopted the suggestion of a German psychologist that scores on the Stanford-Binet test be expressed in terms of a single number, called the **intelligence quotient,** or **IQ.** This number was derived by dividing the individual's mental age by the chronological age and multiplying the result by 100. Thus, a child of average intelligence, whose mental age and chronological age were the same, would have an IQ score of 100. A "bright" 10-year-old child with a mental age of 13 would have an IQ of 130 ($^{13}/_{10} \times 100$). A "slow" child with a chronological age of 10 and a mental age of 7 would have an IQ of 70 ($^{7}/_{10} \times 100$). It was Terman's use of the intelligence quotient that resulted in the popularization of the phrase "IQ test."

World War I and Group Intelligence Testing

When the United States entered World War I in 1917, the U.S. military was faced with the need to rapidly screen 2 million army recruits. Using a group intelligence test designed by one of Terman's students, army psychologists developed the Army Alpha and Beta tests. The *Army Alpha* test was administered in writing, and the *Army Beta* test was administered orally to recruits and draftees who could not read.

After World War I ended, the Army Alpha and Army Beta group intelligence tests were adapted for civilian use. The result was a tremendous surge in the intelligence-testing movement. Group intelligence tests were designed to test virtually all ages and types of people, including preschool children, prisoners, and newly arriving immigrants (Anastasi & Urbina, 1997; Kamin, 1995). However, the indiscriminate use of the tests also resulted in skepticism and hostility.

For example, immigrants were screened as they arrived at Ellis Island. The result was sweeping generalizations about the intelligence of different nationalities and races. During the 1920s, a few intelligence testing experts even urged the U.S. Congress to limit the immigration of certain nationalities to keep the country from being "overrun with a horde of the unfit" (see Kamin, 1995).

Despite concerns about the misuse of the so-called IQ tests, the tests quickly became very popular. Lost was Binet's belief that intelligence tests were useful only to identify those who might benefit from special educational help. Contrary to Binet's contention, it soon came to be believed that the IQ score was a fixed, inborn characteristic that was resistant to change (Gould, 1993).

Terman and other American psychologists believed that a high IQ predicted more than success in school. To investigate the relationship between IQ and success in life, Terman (1926) identified 1,500 California school-children with "genius" IQ scores. He set up a longitudinal research study to follow their careers throughout their lives. Some of the findings of this landmark study are described in the In Focus box "Does a High IQ Score Predict Success in Life?" on the next page.

- **intelligence** The global capacity to think rationally, act purposefully, and deal effectively with the environment.
- **mental age** A measurement of intelligence in which an individual's mental level is expressed in terms of the average abilities of a given age group.
- **intelligence quotient (IQ)** A measure of general intelligence derived by comparing an individual's score with the scores of others in the same age group.



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Testing Immigrants at Ellis Island This photograph, taken in 1917, shows an examiner administering a mental test to a newly arrived immigrant at the U.S. immigration center on Ellis Island. According to one intelligence "expert" of the time, 80 percent of the Hungarians, 79 percent of the Italians, and 87 percent of the Russians were "feeble-minded" (see Kamin, 1995). The new science of "mental testing" was used to argue for restrictions on immigration.

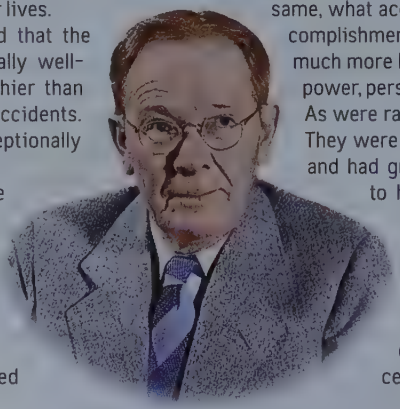
IN FOCUS

Does a High IQ Score Predict Success in Life?

In 1921, Lewis M. Terman identified 1,500 California children between the ages of 8 and 12 who had IQs above 140, the minimum IQ score for genius-level intelligence. Terman's goal was to track these children by conducting periodic surveys and interviews to see how genius-level intelligence would affect the course of their lives.

Within a few years, Terman (1926) showed that the highly intelligent children tended to be socially well-adjusted, as well as taller, stronger, and healthier than average children, with fewer illnesses and accidents. Not surprisingly, those children performed exceptionally well in school.

But how did Terman's "gifted" children fare in the real world as adults? As a group, they showed an astonishing range of accomplishments (Terman & Oden, 1947, 1959). In 1955, when average income was $5,000 a year, the average income for the group was $33,000. Two-thirds had graduated from college, and a sizable proportion had earned advanced academic or professional degrees.



With the exception of moral character, there is nothing as significant for a child's future as his grade of intelligence.

News Service, Stanford University — *Lewis M. Terman (1916)*

However, not all of Terman's subjects were so successful. To find out why, Terman's colleague Melita Oden compared the 100 most successful men (the "A" group) and the 100 least successful men (the "C" group) in Terman's sample. Despite their high IQ scores, only a handful of the C group were professionals, and, unlike the A group, the Cs were earning only slightly above the national average income. In terms of their personal lives, the Cs were less healthy, had higher rates of alcoholism, and were three times more likely to be divorced than the As (Terman & Oden, 1959).

Given that the IQ scores of the A and C groups were essentially the same, what accounted for the difference in their levels of accomplishment? Terman noted that, as children, the As were much more likely to display "prudence and forethought, will power, perseverance, and the desire to excel." As adults, the As were rated differently from the Cs on only three traits: They were more goal oriented, had greater perseverance, and had greater self-confidence. Overall, the As seemed to have greater ambition and a greater drive to achieve. In other words, *personality factors* seemed to account for the differences in level of accomplishment between the A group and the C group (Terman & Oden, 1959).

As the general success of Terman's gifted children demonstrates, high intelligence can certainly contribute to success in life. But intelligence alone is not enough. Although IQ scores do reliably predict academic success, success in school is no guarantee of success beyond school. Many different personality factors are involved in achieving success: motivation, emotional maturity, commitment to goals, creativity, and—perhaps most important—a willingness to work hard (Duckworth & others, 2007; Furnham, 2008). None of these attributes are measured by traditional IQ tests.

David Wechsler and the Wechsler Intelligence Scales



David Wechsler Born in Romania, David Wechsler (1896–1981) emigrated with his family to New York when he was six years old. Like Binet, Wechsler believed that intelligence involved a variety of mental abilities. He also strongly believed that IQ scores could be influenced by personality, motivation, and cultural factors (Matarazzo, 1981).

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The next major advance in intelligence testing came as a result of a young psychologist's dissatisfaction with the Stanford-Binet and other intelligence tests in widespread use. **David Wechsler** was in charge of testing adults of widely varying cultural and socioeconomic backgrounds and ages at a large hospital in New York City. He designed a new intelligence test, called the *Wechsler Adult Intelligence Scale (WAIS)*, which was first published in 1955.

The WAIS had two advantages over the Stanford-Binet. First, the WAIS was specifically designed for adults, rather than for children. Second, Wechsler's test provided scores on 11 subtests measuring different abilities. The subtest scores were grouped to provide an overall verbal score and performance score. The *verbal score* represented scores on subtests of vocabulary, comprehension, knowledge of general information, and other verbal tasks. The *performance score* reflected scores on largely nonverbal subtests, such as identifying the missing part in incomplete pictures, arranging pictures to tell a story, or arranging blocks to match a given pattern.

The design of the WAIS reflected Wechsler's belief that intelligence involved a variety of mental abilities. Because the WAIS provided an individualized profile of the subject's strengths and weaknesses on specific tasks, it marked a return to the attitudes and goals of Alfred Binet (Fancher, 1996; Sternberg, 1990).

The subtest scores on the WAIS also proved to have practical and clinical value. For example, a pattern of low scores on some subtests combined with high scores on other subtests might indicate a specific learning disability (Kaufman, 1990). Or someone who did well on the performance subtests but poorly on the verbal subtests might be unfamiliar with the culture rather than deficient in these skills (Aiken, 1997). That's because many items included on the verbal subtests draw on cultural knowledge.

Wechsler's test also provided an overall, global IQ score, but he changed the way that the IQ score was calculated. On the Stanford-Binet and other early tests, the IQ represented the mental age divided by chronological age. But this approach makes little sense when applied to adult subjects. Although a 12-year-old is typically able to answer more questions than an 8-year-old because of developmental differences, such year-by-year age differences lose their meaning in adulthood.

Instead, Wechsler calculated the IQ by comparing an individual's score with the scores of others in the same general age group, such as young adults. The average score for a particular age group was statistically fixed at 100. The range of scores is statistically defined so that two-thirds of all scores fall between 85 and 115—the range considered to indicate "normal" or "average" intelligence. This procedure proved so successful that it was adopted by the administrators of other tests, including the current version of the Stanford-Binet. Today, IQ scores continue to be calculated by this method.

The WAIS was revised in 1981, 1997, and most recently, in 2008. The fourth edition of the WAIS is known as WAIS-IV. Since the 1960s, the WAIS has remained the most commonly administered intelligence test. Wechsler also developed two tests for children: the *Wechsler Intelligence Scale for Children (WISC)* and the *Wechsler Preschool and Primary Scale of Intelligence (WPPSI)*.



David Young-Wolff/Photo Edit

The Wechsler Intelligence Scale for Children (WISC) Revised and updated in 2003, the WISC-IV is designed to assess the intelligence of children ages 6 to 16. This psychologist is administering the WISC-IV block design subtest to a 6-year-old girl. Other WISC-IV subtests include vocabulary, arithmetic, and arranging pictures so that they logically tell a story.

Principles of Test Construction

What Makes a Good Test?

Many kinds of psychological tests measure various aspects of intelligence or mental ability. **Achievement tests** are designed to measure a person's level of knowledge, skill, or accomplishment in a particular area, such as mathematics or a foreign language. In contrast, **aptitude tests** are designed to assess a person's capacity to benefit from education or training. The overall goal of an aptitude test is to predict your ability to learn certain types of information or perform certain skills.

Any psychological test must fulfill certain requirements to be considered scientifically acceptable. The three basic requirements of good test design are standardization, reliability, and validity. Let's briefly look at what each of those requirements entails.

Standardization

If you answer 75 of 100 questions correctly, what does that score mean? Is it high, low, or average? For an individual's test score to be interpreted, it has to be compared against some sort of standard of performance.

Standardization means that the test is given to a large number of subjects who are representative of the group of people for whom the test is designed. All the subjects take the same version of the test under uniform conditions. The scores of this group establish the *norms,* or the standards against which an individual score is compared and interpreted.

For IQ tests, such norms closely follow a pattern of individual differences called the **normal curve,** or **normal distribution.** In this bell-shaped pattern, most scores cluster around the average score. As scores become more extreme, fewer instances of the scores occur. In Figure 7.6 on the next page, you can see the normal distribution of IQ scores on the WAIS-III. About 68 percent of subjects taking the WAIS-III will score between 85 and 115, the IQ range for "normal" intelligence. Less than one-tenth of 1 percent of the population have extreme scores that are above 145 or below 55.

achievement test A test designed to measure a person's level of knowledge, skill, or accomplishment in a particular area.

aptitude test A test designed to assess a person's capacity to benefit from education or training.

standardization The administration of a test to a large, representative sample of people under uniform conditions for the purpose of establishing norms.

normal curve or **normal distribution** A bell-shaped distribution of individual differences in a normal population in which most scores cluster around the average score.

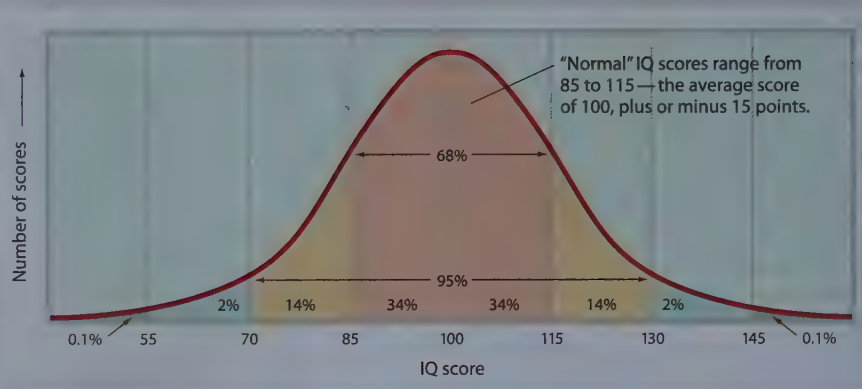


FIGURE 7.6 The Normal Curve of Distribution of IQ Scores The distribution of IQ scores on the WAIS-III in the general population tends to follow a bell-shaped normal curve, with the average score defined as 100. Notice that 68 percent of the scores fall within the "normal" IQ range of 85 to 115. Ninety-five percent of the general population score between 70 and 130, while only one-tenth of 1 percent score lower than 55 or higher than 145.

Reliability

A good test must also have **reliability.** That is, it must consistently produce similar scores on different occasions. How do psychologists determine whether a psychological test is reliable? One method is to administer two similar, but not identical, versions of the test at different times. Another procedure is to compare the scores on one half of the test with the scores on the other half of the test. A test is considered reliable if the test and retest scores are highly similar when such strategies are used.

Validity

Finally, a good test must demonstrate **validity,** which means that the test measures what it is supposed to measure. One way to establish the validity of a test is by demonstrating its predictive value. For example, if a test is designed to measure mechanical aptitude, people who received high scores should ultimately prove more successful in mechanical jobs than people who received low scores.



The Nature of Intelligence

KEY THEME

› Psychologists do not agree about the basic nature of intelligence, including whether it is a single, general ability and whether it includes skills and talents as well as mental aptitude.

KEY QUESTIONS

› What is *g*, and how did Spearman and Thurstone view intelligence?

› What is Gardner's theory of multiple intelligences?

› What is Sternberg's triarchic theory of intelligence?

The Wechsler Adult Intelligence Scale and the Stanford-Binet Intelligence Scale are standardized, reliable, and valid. But do they adequately measure intelligence? The question is not as simple as it sounds. There is considerable disagreement among psychologists about the nature of intelligence, including how intelligence should best be defined and measured (Gardner, 2011; Neisser & others, 1996).

Take another look at the chapter Prologue about Tom and his family. In terms of the type of intelligence that is measured by IQ and other standardized tests, Tom is highly intelligent. But despite his high IQ, Tom can find it extremely difficult to carry out many activities that those with a more "normal" or average intelligence can perform almost effortlessly. Applying for an after-school job, joining a conversation that is already in progress, or even knowing why—or whether—a particular joke is funny are very difficult, if not impossible, tasks for Tom. As you'll see in the next section, psychologists have struggled with the challenge of how to define intelligence for over a century.

reliability The ability of a test to produce consistent results when administered on repeated occasions under similar conditions.

validity The ability of a test to measure what it is intended to measure.

***g* factor** or **general intelligence** The notion of a general intelligence factor that is responsible for a person's overall performance on tests of mental ability.

Theories of Intelligence

Much of the controversy over the definition of *intelligence* centers on two key issues. First, is intelligence a single, general ability, or is it better described as a cluster of different mental abilities? And second, should the definition of intelligence be restricted to the mental abilities measured by IQ and other intelligence tests? Or should intelligence be defined more broadly?

Although these issues have been debated for more than a century, they are far from being resolved. In this section, we'll describe the views of four influential psychologists on both issues.

Charles Spearman

Intelligence Is a General Ability

Some psychologists believe that a common factor, or general mental capacity, is at the core of different mental abilities. This approach originated with British psychologist **Charles Spearman.** Although Spearman agreed that an individual's scores could vary on tests of different mental abilities, he found that the scores on different tests tended to be similar. That is, people who did well or poorly on a test of one mental ability, such as verbal ability, tended also to do well or poorly on the other tests.

Spearman recognized that particular individuals might excel in specific areas. However, Spearman (1904) believed that a factor he called **general intelligence,** or the ***g* factor,** was responsible for their overall performance on tests of mental ability. Psychologists who follow this approach today think that intelligence can be described as a single measure of general cognitive ability, or *g* factor (Gottfredson, 1998). Thus, general mental ability could accurately be expressed by a single number, such as the IQ score. Lewis Terman's approach to measuring and defining intelligence as a single, overall IQ score was in the tradition of Charles Spearman. In terms of Spearman's model, Tom would undoubtedly score very highly on any test that measured g factor or general intelligence. For example, when he took the SAT as a high school junior, he scored in the top 3 percent in math and received a perfect score on the writing section.



Charles Spearman (1863–1945)
British psychologist Charles Spearman (1904) believed that a single factor, which he called the *g* factor, underlies many different kinds of mental abilities. To Spearman, a person's level of general intelligence was equivalent to his or her level of "mental energy."

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Louis L. Thurstone

Intelligence Is a Cluster of Abilities

Psychologist **Louis L. Thurstone** disagreed with Spearman's notion that intelligence is a single, general mental capacity. Instead, Thurstone believed that there were seven different "primary mental abilities," each a relatively independent element of intelligence. Verbal comprehension, numerical ability, reasoning, and perceptual speed are examples Thurstone gave of independent "primary mental abilities."

To Thurstone, the so-called *g* factor was simply an overall average score of such independent abilities and consequently was less important than an individual's specific *pattern* of mental abilities (Thurstone, 1937). David Wechsler's approach to measuring and defining intelligence as a pattern of different abilities was very similar to Thurstone's approach.



Louis L. Thurstone (1887–1955)
American psychologist Louis Thurstone studied electrical engineering and was an assistant to Thomas Edison before he became interested in the psychology of learning. Thurstone was especially interested in the measurements of people's attitudes and intelligence, and was an early critic of the idea of "mental age," believing that intelligence was too diverse to be quantified in a single number or IQ score.

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Howard Gardner

"Multiple Intelligences"

More recently, **Howard Gardner** has expanded Thurstone's basic notion of intelligence as different mental abilities that operate independently. However, Gardner has stretched the definition of intelligence (Gardner & Taub, 1999). Rather than analyzing intelligence test results, Gardner (1985, 1993) looked at the kinds of skills and products that are valued in different cultures. He also studied brain-damaged individuals, noting that some mental abilities are spared when others are lost. To Gardner, this phenomenon implies that different mental abilities are biologically distinct and controlled by different parts of the brain.

triarchic theory of intelligence Robert Sternberg's theory that there are three distinct forms of intelligence: analytic, creative, and practical.

Like Thurstone, Gardner has suggested that such mental abilities are independent of each other and cannot be accurately reflected in a single measure of intelligence. Rather than one intelligence, Gardner (1993, 1998a) believes, there are "multiple intelligences." To Gardner, "an intelligence" is the ability to solve problems, or to create products, that are valued within one or more cultural settings. Thus, he believes that intelligence must be defined within the context of a particular culture. Gardner (1998b) has proposed eight distinct, independent intelligences, which are summarized in Figure 7.7.

According to Gardner's model of intelligence, everyone has a different pattern of strengths and weaknesses. How would Tom rate? In terms of linguistic, logical-mathematical, and spatial intelligence, Tom would measure very highly. What about an "intelligence" that wouldn't be measured by a standard IQ test, such as musical intelligence? When I asked Tom what type of music he liked, he couldn't tell me.

> If I like a song, I like it.
> If I don't, I stop listening.
> I really can't categorize it.
> It's not within my power.

Although lacking musical intelligence probably doesn't affect your ability to function in our culture, other "intelligences" are much more crucial. Without question, Tom's biggest shortcoming falls in the realm of interpersonal intelligence. Understanding and relating to other people is extremely difficult for him.

In most cultures, the ability to effectively navigate social situations is crucial to at least one aspect of Wechsler's definition of intelligence: "the ability to deal effectively with the environment." Although people with Asperger's are neither physically nor intellectually disabled, their inability to understand and successfully interact with others contributes to Asperger's syndrome being categorized as a disability. However, not everyone considers Asperger's to be a true disorder. Are the autism spectrum disorders disabilities—or are they differences? We consider this topic in the In Focus box, "Neurodiversity: Beyond IQ," on page 302.

Some of the abilities emphasized by Gardner, such as logical-mathematical intelligence, might be tapped by a standard intelligence test. However, other abilities, such as bodily-kinesthetic intelligence or musical intelligence, do not seem to be reflected on standard intelligence tests. Yet, as Gardner points out, such abilities are recognized and highly valued in many different cultures, including our own.



Jay Gardner ©2004

Howard Gardner and His Theory of Multiple Intelligences According to Howard Gardner, many mental abilities are not adequately measured by traditional intelligence tests. As Gardner (2003) explains, "Different tasks call on different intelligences or combinations of intelligence. To perform music intelligently involves a different set of intelligences than preparing a meal, planning a course, or resolving a quarrel." Examples might include the spatial intelligence shown by the complex designs of Tlingit master carver Nathan Jackson, the extraordinary bodily-kinesthetic intelligence of Russian tennis player Maria Sharapova, and the musical intelligence of Grammy award–winning jazz musician Esperanza Spalding.



Clark James Mishler/AlaskaStock



Kyodo via AP Images



Jeff Fusco/Getty Images

Linguistic intelligence	Adept use of language: poet, writer, public speaker, native storyteller
Logical-mathematical intelligence	Logical, mathematical, and scientific ability: scientist, mathematician, navigator, surveyor
Musical intelligence	Ability to create, synthesize, or perform music: musician, composer, singer
Spatial intelligence	Ability to mentally visualize the relationships of objects or movements: sculptor, painter, expert chess player, architect
Bodily-kinesthetic intelligence	Control of bodily motions and capacity to handle objects skillfully: athlete, dancer, craftsperson
Interpersonal intelligence	Understanding of other people's emotions, motives, intentions: politician, salesperson, clinical psychologist
Intrapersonal intelligence	Understanding of one's own emotions, motives, and intentions: essayist, philosopher
Naturalist intelligence	Ability to discern patterns in nature: ecologist, zoologist, botanist

FIGURE 7.7 Gardner's Multiple Intelligences

Robert Sternberg

Three Forms of Intelligence

Robert Sternberg agrees with Gardner that intelligence is a much broader quality than is reflected in the narrow range of mental abilities measured by a conventional IQ test. However, Sternberg (1988, 1995) disagrees with Gardner's notion of multiple, independent intelligences. He believes that some of Gardner's intelligences are more accurately described as specialized talents, whereas intelligence is a more general quality. Sternberg (1988) points out that you would be able to manage just fine if you were tone-deaf and lacked "musical intelligence" in most societies. However, if you didn't have the ability to reason and plan ahead, you would be unable to function in any culture.

Sternberg's **triarchic theory of intelligence** emphasizes both the universal aspects of intelligent behavior and the importance of adapting to a particular social and cultural environment. More specifically, Sternberg (1997) has proposed a different conception of intelligence, which he calls *successful intelligence*. Successful intelligence involves three distinct types of mental abilities: analytic, creative, and practical.

Analytic intelligence refers to the mental processes used in learning how to solve problems, such as picking a problem-solving strategy and applying it. Although conventional intelligence tests measure mental abilities, they do not evaluate the strategies used to solve problems, which Sternberg considers important in determining analytic intelligence. In the prologue, Tom's ability to solve complex mathematical equations reflects analytical intelligence.

Creative intelligence is the ability to deal with novel situations by drawing on existing skills and knowledge. The intelligent person effectively draws on past experiences to cope with new situations, which often involves finding an unusual way to relate old information to new. We'll explore the topic of creativity in more detail in the Enhancing Well-Being with Psychology section at the end of the chapter.

Practical intelligence involves the ability to adapt to the environment and often reflects what is commonly called "street smarts." Sternberg notes that what is required to adapt successfully in one particular situation or culture may be very different from what is needed in another situation or culture. He stresses that the behaviors that reflect practical intelligence can vary depending on the particular situation, environment, or culture.



Robert Sternberg (b. 1949) Steinberg first became interested in studying intelligence after he did poorly on a sixth grade intelligence test. He later realized that test anxiety had interfered with his performance. Throughout his college years, Sternberg did poorly in courses that required rote learning—including his first psychology course at Yale. However, Sternberg persevered. He went on win many awards for his research and, in 2003, was elected president of the American Psychological Association. Much of Sternberg's career has been devoted to studying nontraditional types of intelligence, such as creativity and wisdom, and developing new ways to measure these qualities (Kaufman & others, 2009).

Courtesy Robert Sternberg/Tufts University

IN FOCUS

Neurodiversity: Beyond IQ

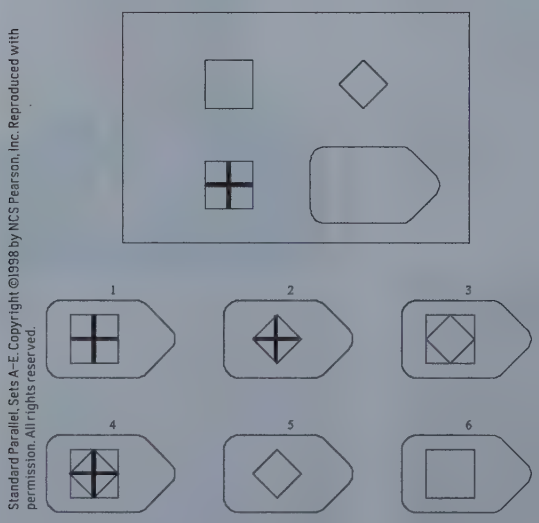
Can intelligence be summarized by an IQ score? Do standard intelligence tests adequately measure intelligence? Although the questions seem very abstract, their answers can have very real consequences. To give these questions a human face, consider the case of people with autistic symptoms.

Tom, whose story you read in the Prologue, has a very high IQ as measured on standard intelligence tests. However, his inability to navigate social situations makes him less competent in many everyday activities than people with lower IQ scores.

Such difficulties are the hallmark of the *autism spectrum disorders*, whose common feature is problems with communication and social interaction. **Autism** is the most severe of these disorders. Along with severely impaired communication, autistic individuals may be unresponsive to social interaction, engage in repetitive or odd motor behaviors, and have highly restricted routines and interests (Toth & King, 2008).

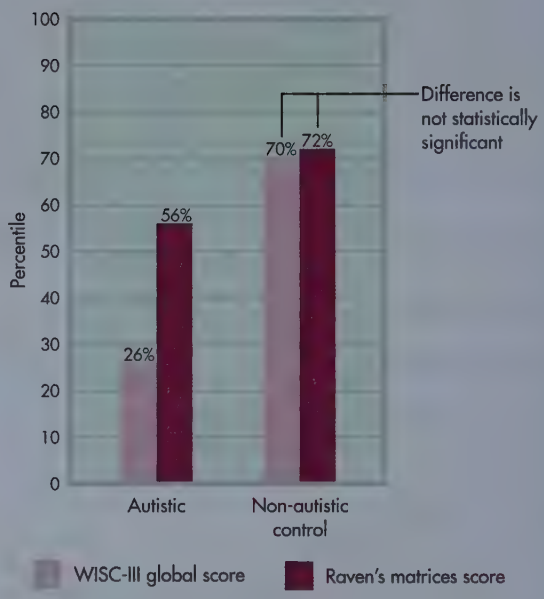
Unlike children with autism, children with **Asperger's syndrome** show normal, even advanced, language development. They may exhibit unusually narrow interests and inflexible behavior, but to a much lesser degree than people with autism. And, by definition, people with Asperger's have an IQ in the normal to genius range.

What about the cognitive abilities of people with autism? Many people believe that most autistics are *autistic savants*, like the character "Raymond" played by Dustin Hoffman in the movie *Rainman*. Autistic savants have some extraordinary talent or ability, usually in a very limited area such as math, music, or art. In reality, only about 1 in 10 autistic people are savants (see Dawson & others, 2008; Treffert & Wallace, 2003). However, fewer than 1 in 2,000 non-autistic people have such exceptional abilities.



Standard Parallel, Sets A–E. Copyright ©1998 by NCS Pearson, Inc. Reproduced with permission. All rights reserved.

Sample Items from the Raven's Progressive Matrices Test The Raven's test consists of matrix problems that become progressively more difficult. The instructions are simple: Choose the item that best completes the pattern. The test was developed to test general mental ability and is thought to be the "purest" measure of Charles Spearman's *g* factor (Holyoak, 2005).



Measuring Intelligence On the average, autistic children scored fully 30 percentile points higher on the nonverbal Raven's Progressive Matrices Test than they did on the WISC-III, which depends heavily on oral instruction and responses. In contrast, a matched control group of non-autistic children received scores that were essentially identical. Adult participants showed a similar pattern. Although a small-scale study, such results suggest that traditional intelligence tests may underestimate intelligence in autistic children and adults. In fact, one-third of the autistic children scored above the 90th percentile on the Raven's, but none did so on the WISC-III. One child raised his score 70 percentile points from 24 to 94 percent—putting him in the "highly intelligent" range rather than the "low-functioning" range.

Another common assumption is that most people with autism are mentally retarded (e.g., Brown & others, 2008). **Mental retardation** is a condition in which IQ is 70 or below. However, surveying decades of research, psychologist Meredyth Edelson (2006) found that there was little empirical research to support the claim that the majority of autistic people are mentally retarded. In fact, because their symptoms vary so much, it's very difficult to generalize about the cognitive abilities of people with autistic spectrum disorders (Sigman & others, 2006).

It is also hard to accurately *measure* intelligence in people who lack the ability to communicate or who are not good at social interaction. In children, for example, intelligence is most commonly measured by Wechsler-based tests, like the WISC-III. But is the WISC-III, which relies heavily on verbal instruction and oral

communication, an appropriate instrument for measuring intelligence in autistic children?

To address this question, Michelle Dawson and her colleagues (2007) used the *Raven's Progressive Matrices Test* to measure intelligence in autistic children and adults (see sample items). A *nonverbal* test of logic and higher-level abstract thinking, the test was developed by John Raven, one of Spearman's students. Because the test does not rely upon previously learned information, many cognitive psychologists regard it as an especially pure test of Spearman's g factor (Holyoak, 2005).

In Dawson's study, children and adults with autism took both the Wechsler and the Raven's tests. How did they do? On average, the autistic children scored at the 26th percentile on the Wechsler—a score that would label them as mentally retarded or low-functioning and well below an average score of 50 percent. In contrast, their average score on the Raven's was 56 percent, *fully 30 percentile points higher*, a difference that moved many children from the low-functioning or mentally retarded range to the normal range. A similar pattern was found in autistic adults.

Did non-autistic subjects also show a big difference in scores on the Wechsler versus the Raven's? No. Members of the non- autistic control groups received very similar scores on the Wechsler and Raven's tests (see graph).

> Many autistics affirm that it would be impossible to segregate the part of them that is autistic. To take away their autism is to take away their personhood. . . . Like their predecessors in human rights, many autistics don't want to be cured; they want to be accepted. And like other predecessors in civil rights, many autistics don't want to be required to imitate the majority just to earn their rightful place in society.
>
> *Morton Ann Gernsbacher, 2004*

There's an interesting twist to this story. The lead author, Michelle Dawson, who planned the study, handled the data collection, supervised the statistical analysis, and wrote the first draft, is herself autistic. Dawson can't cook, drive, take public transportation, or handle many other everyday tasks. However, Dawson has a phenomenal memory and a razor-sharp logical mind. According to her co-researcher, University of Montreal psychiatrist Laurent Mottron (2008), Dawson also has a remarkable gift for scientific analysis.

It was Dawson who came up with the idea for the study (Gernsbacher, 2007b). As Dawson (2007) observes, testing autistic kids' intelligence in a way that requires them to verbally interact with a stranger "is like giving a blind person an intelligence test that requires him to process visual information." On intelligence tests, the assumption has always been that when someone doesn't answer a question, it's because they don't know the answer. But there is another possibility: Perhaps they simply can't express what they know (Gernsbacher, 2004; Gernsbacher & others, 2008).

Why are such findings so important? Well, what happens to children who are labeled as "mentally retarded," "low-functioning," or "uneducable"? As Laurent Mottron (2006) points out, "If we classify children as intellectually deficient, then that is how they will be treated. They will be denied a host of opportunities."

Today, many researchers, parents, and people "on the spectrum" are embracing a new approach to spectrum disorders. Called *neurodiversity*, it is the recognition that people with autistic spectrum symptoms process information, communicate, and experience their social and physical environment differently than *neurotypical* people who don't have autistic symptoms. Rather than viewing autism as a *disorder* or *disease*, advocates of this viewpoint believe that it should be viewed as a *disability*, like deafness, or a *difference*, like left-handedness (see Jaarsma & Welin, 2011; Trivedi, 2005).

Neurodiversity advocates do *not* deny that autistic people need special training and support (Baron-Cohen, 2000, 2005). Autism rights activists Amy Roberts and Gareth Nelson (2005) suggest that rather than trying to "cure" autistics and make them more like non-autistic people, researchers should emphasize giving autistic children and adults the tools that they need to survive in a world that is designed for non-autistic people.

Disorder, disease, disability, or difference? We'll give noted autism researcher Simon Baron-Cohen (2007) the last word:

> Autism is both a disability and a difference. We need to find ways of alleviating the disability while respecting and valuing the difference.



Tyrel Featherston/Ottawa Citizen. Republished by permission.

Michelle Dawson Michelle Dawson readily admits that coping with many everyday challenges is beyond her. Yet, according to her colleague Laurent Mottron (2008), "Michelle is someone who will change the way an entire sector of humanity is considered." Dawson met neuroscientist and autism researcher Mottron when they both appeared on a documentary about autism. Recognizing Dawson's intelligence, Mottron asked her to read some of his scientific papers. When she responded with an insightful critique of his methodology, Mottron took her on as a research collaborator. Since that time, Dawson has co-authored several papers with Mottron and other scientists, including Morton Ann Gernsbacher, former president of the Association for Psychological Science.

autism Behavioral syndrome associated with differences in brain functioning and sensory responses, and characterized by impaired social interaction, impaired verbal and nonverbal communication skills, repetitive or odd motor behaviors, and highly restricted interests and routines.

Asperger's syndrome Behavioral syndrome characterized by varying degrees of difficulty in social and conversational skills but normal-to-above-average intelligence and language development; often accompanied by obsessive preoccupation with particular topics or routines.

mental retardation Disorder characterized by intellectual function that is significantly below average, usually defined as a measured IQ of 70 or below, and that is caused by brain injury, disease, or a genetic disorder.

How would Tom fare by Sternberg's criteria? Although high in most measures of analytic intelligence, Tom would probably not rank very highly in creative or practical intelligence. Successful adaptation involves the flexibility to choose the best problem-solving strategy or to know when to change strategies.

What about practical intelligence? As shown in the prologue, dealing with the social and academic environment of high school is not easy for Tom. However, many people with Asperger's find a compatible niche in workplaces in which their ability to focus their attention on a particular technical problem, their preoccupation with details, and other unusual abilities are highly valued, such as in computer programming or engineering firms. In such an environment, their lack of social skills might actually be advantageous (Mayor, 2008). As Sternberg's theory would predict, behaviors that are deemed "intelligent" in one environment—such as a software development firm—might well be maladaptive in another environment—like a high school cafeteria (Sternberg, 2008).

The exact nature of intelligence will no doubt be debated for some time. However, the intensity of this debate pales in comparison with the next issue we consider: the origins of intelligence.

CONCEPT REVIEW 7.2

Major Contributors to the Intelligence Debate

Identify the psychologist who is described by each statement. Choose from: Binet, Terman, Wechsler, Spearman, Thurstone, Gardner, Sternberg.

_____ 1. Contemporary American psychologist who proposed that there are three aspects of intelligence: analytic, creative, and practical.

_____ 2. French psychologist who is credited with developing the first practical intelligence test.

_____ 3. American psychologist whose widely used intelligence test provides both a global IQ score and scores on verbal and performance tests.

_____ 4. British psychologist who advanced the theory that overall intellectual ability is a function of a general intelligence factor, called the *g* factor.

_____ 5. Contemporary American psychologist who proposed that there were multiple independent intelligences and that an intelligence was an ability that is valued within a particular cultural setting.

_____ 6. American psychologist who believed that there were seven different primary mental abilities rather than a single *g* factor.

_____ 7. American psychologist who translated and adapted Binet's intelligence test for use in the United States.

The Roles of Genetics and Environment in Determining Intelligence

KEY THEME

› Both genes and environment contribute to intelligence, but the relationship is complex.

KEY QUESTIONS

› How are twin studies used to measure genetic and environmental influences on intelligence?

› What is a heritability estimate, and why can't it be used to explain differences between groups?

› What social and cultural factors affect performance on intelligence tests?

The nature-versus-nurture debate is now informed by current research on molecular biology that moves the question from which factor is more important to how and when expression of the human genome is triggered and maintained. The basic behavior genetics issue has become how environment influences gene expression.

Bernard Brown (1999)

Given that psychologists do not agree on the definition or nature of intelligence, it probably won't surprise you to learn that psychologists also do not agree on the *origin of intelligence*. On the surface, the debate comes down to this: Do we essentially *inherit* our intellectual potential from our parents, grandparents, and great-grandparents? Or is our intellectual potential primarily determined by our *environment* and upbringing?

Virtually all psychologists agree that *both* heredity and environment are important in determining intelligence level. Where psychologists disagree is in identifying how much of intelligence is determined by heredity and how much by environment. The implications of this debate have provoked some of the most heated arguments in the history of psychology.

Let's start with some basic points about the relationship between genes and the environment. It was once believed that genes provided an unchanging, permanent blueprint for human development. As we'll discuss in Chapter 9, the "genes as blueprint" metaphor has today been replaced by a "genes as data bank" metaphor (Brown, 1999; Marcus, 2004). It's now known that environmental factors influence *which* of the many genes we inherit are actually switched on, or activated. As psychologist Bernard Brown (1999) writes, "Genes are not destiny. There are many places along the gene–behavior pathway where genetic expression can be regulated."

Take the example of height. You inherit a potential *range* for height, rather than an absolute number of inches. Environmental factors influence how close you come to realizing that genetic potential. If you are healthy and well-nourished, you may reach the maximum of your genetic height potential. But if you are poorly nourished and not healthy, you probably won't.

To underscore the interplay between heredity and environment, consider the fact that the average height of Americans has increased by several inches in the past half-century. The explanation for this increase is that nutritional and health standards have steadily improved, not that the genetic heritage of Americans has fundamentally changed. However, heredity does play a role in establishing *limits* on height. If you're born with "short" genes (like your authors), you're unlikely to reach six foot four, no matter how good your nutrition. (For more on genetics see Chapter 9.)

The roles of heredity and environment in determining intelligence and personality factors are much more complex than the simple examples of height or eye color (Plomin, 2003; Johnson, 2010). However narrowly intelligence is defined, the genetic range of intellectual potential is influenced by *many* genes, not by one single gene (Plomin & Spinath, 2004; Johnson, 2010). No one knows how many genes might be involved. Given the complexity of genetic and environmental influences, how do scientists estimate how much of intelligence is due to genetics and how much to environment?

> We need to appreciate that all human behavior is based on biology and, hence, will involve some degree of genetic influence. But, equally, all social behavior is bound to be affected by social context and, hence, will involve an important environmental influence.
>
> *Michael Rutter (1997)*

Twin Studies

Sorting Out the Influence of Genetics Versus Environment

One way this issue has been explored is by comparing the IQ scores of individuals who are genetically related to different degrees. *Identical twins* share exactly the same genes because they developed from a single fertilized egg that split into two. Hence, any dissimilarities between them must be due to environmental factors rather than hereditary differences. *Fraternal twins* are like any other pair of siblings because they develop from two different fertilized eggs.

As you can see in Figure 7.8 on the next page, comparing IQ scores in this way shows the effects of both heredity and environment. Identical twins raised together have very similar IQ scores, whereas fraternal twins raised together have IQs that are less similar (Plomin & Spinath, 2004).

However, notice that identical twins raised in separate homes have IQs that are slightly less similar, indicating the effect of different environments. And, although fraternal twins raised together have less similar IQ scores than do identical twins, they show more similarity in IQs than do nontwin siblings. Recall that the degree of genetic relatedness between fraternal twins and nontwin siblings is essentially the same. But because fraternal twins are the same age, their environmental experiences are likely to be more similar than are those of siblings who are of different ages.

Thus, *both* genetic *and* environmental influences are important. Genetic influence is shown by the fact that the closer the genetic relationship, the more similar the IQ scores. Environmental influences are demonstrated by



Genetics or Environment? These identical twins have a lot in common—including a beautiful smile. Twins are often used in studies of the relative contributions that heredity and environment make to personality and other characteristics.

Digital Vision/Alamy

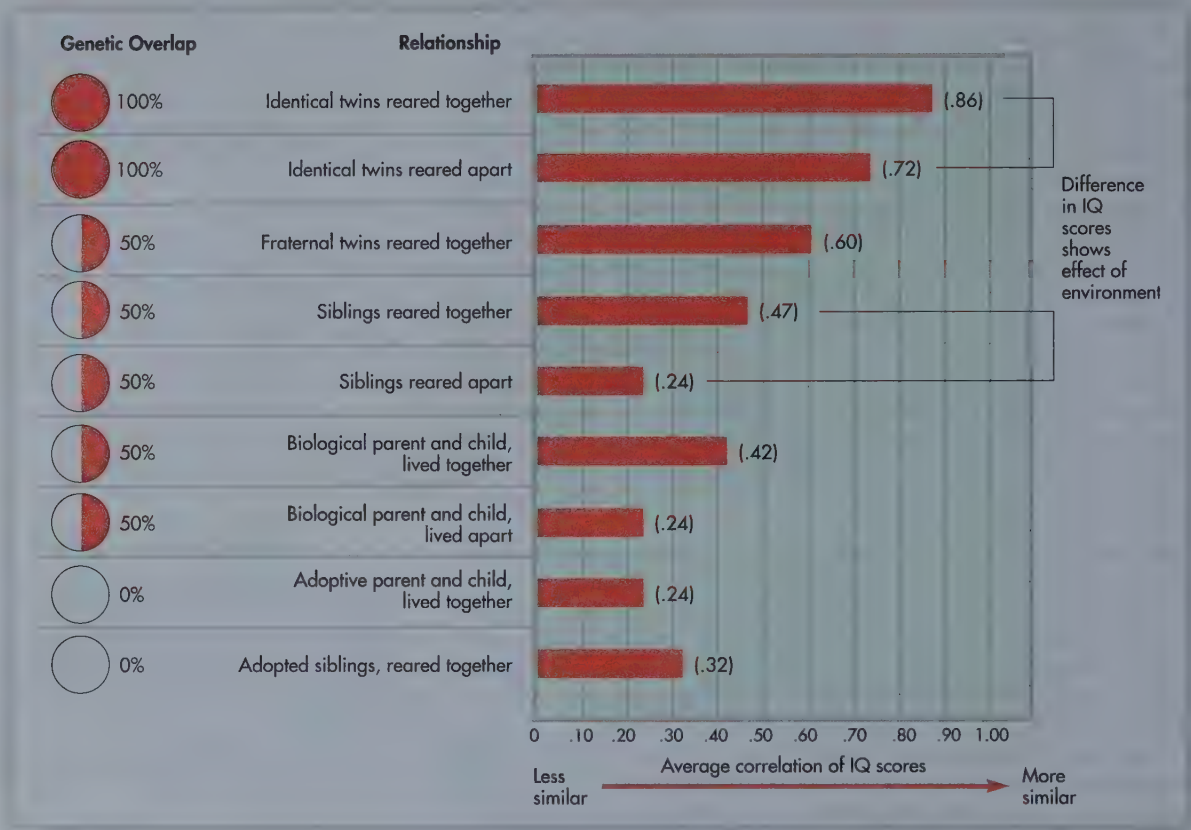


FIGURE 7.8 Genetics, Environment, and IQ Scores This graph shows the average correlations of IQ scores for individuals who are genetically related to different degrees. The graph is based on research by psychologists Thomas Bouchard and Matt McGue, who summarized the results from more than 100 separate studies on over 100,000 pairs of relatives (McGue & others, 1993). The data show that both genetics and environment have an effect on IQ scores. The more closely two individuals are related genetically, the more similar their IQ scores: Identical twins reared together are more alike than are fraternal twins reared together. However, the same data also show the importance of environmental influences: Identical twins reared together are more alike than are identical twins reared apart, and siblings who are reared together are more alike than are siblings reared in different homes.

two findings: First, two people who are genetically identical but are raised in different homes have different IQ scores. And second, two people who are genetically unrelated but are raised in the same home have IQs that are much more similar than are those of two unrelated people from randomly selected homes.

Using studies based on degree of genetic relatedness and using sophisticated statistical techniques to analyze the data, researchers have scientifically estimated **heritability**—the percentage of variation within a given population that is due to heredity. The currently accepted *heritability estimate* is about 50 percent for the general population (see Plomin, 2003; Plomin & Spinath, 2004).

In other words, approximately 50 percent of the difference in IQ scores *within* a given population is due to genetic factors. But there is disagreement even over this figure, depending on the statistical techniques and data sources used (Deary & others, 2009; Turkheimer & others, 2003).

It is important to stress that the 50 percent figure does *not* apply to a single individual's IQ score. If Mike's IQ is 120, it does not mean that 60 IQ points are due to Mike's environment and 60 points are genetically inherited. Instead, the 50 percent heritability estimate means that approximately 50 percent of the difference in IQ scores *within a specific group of people* is due to differences in their genetic makeup. More on this key point shortly.

heritability The percentage of variation within a given population that is due to heredity.

Group Differences in IQ Scores

If the contributions of heredity and environment are roughly equal, why all the fuss? Much of the controversy over the role of heredity in intelligence is due to attempts to explain the differences in average IQ scores for different racial groups.

In comparing the *average* IQ for various racial groups, several studies have shown differences. For example, Japanese and Chinese schoolchildren tend to score above European American children on intelligence and achievement tests, especially in math

(Gonzales & others, 2008; Organization for Economic Cooperation and Development [OECD], 2010). Are Japanese and Chinese children genetically more intelligent than European American children?

Consider this finding: In early childhood, there are *no* significant differences in IQ among European American, Japanese, and Chinese schoolchildren. The scores of the three groups are essentially the same (Stevenson & Stigler, 2006). The gap begins to appear only after the children start school, and it increases with every year of school attended. By middle school, Asian students tend to score much higher than American students on both math and reading tests.

Why the increasing gap once children enter school? Japanese and Chinese students spend more time in school, spend more time doing homework, and experience more pressure and support from their parents to achieve academically. In addition, the Japanese and Chinese cultures place a high value on academic achievement (Gardner, 1995; Li, 2005). Clearly, the difference between American and Asian students is due not to genetics but to the educational system.



Patrick Frilet/Hemis/Corbis

Culture and Educational Achievement These little girls attend kindergarten in Tokyo, Japan. Children in Japan attend school six days a week. Along with spending more time in school each year than American children, Japanese children grow up in a culture that places a strong emphasis on academic success as the key to occupational success.

Differences *Within* Groups Versus Differences *Between* Groups

Some group differences in average IQ scores do exist (Ceci & Williams, 2009). In many societies, the average IQ scores of minority groups are lower than the average IQ scores of the dominant or majority groups. The question is how to explain such differences. Heritability cannot be used to explain group differences. Although it is possible to estimate the degree of difference *within* a specific group that is due to genetics, it makes no sense to apply this estimate to the differences *between* groups (Rose, 2009). Why? A classic analogy provided by geneticist Richard Lewontin (1970) may help you understand this important point (see Ceci & Williams, 2009).

Suppose you have a 50-pound bag of corn seeds and two pots. A handful of seeds is scooped out and planted in pot A, which has rich, well-fertilized soil. A second handful is scooped out and planted in pot B, which has poor soil with few nutrients (see Figure 7.9).

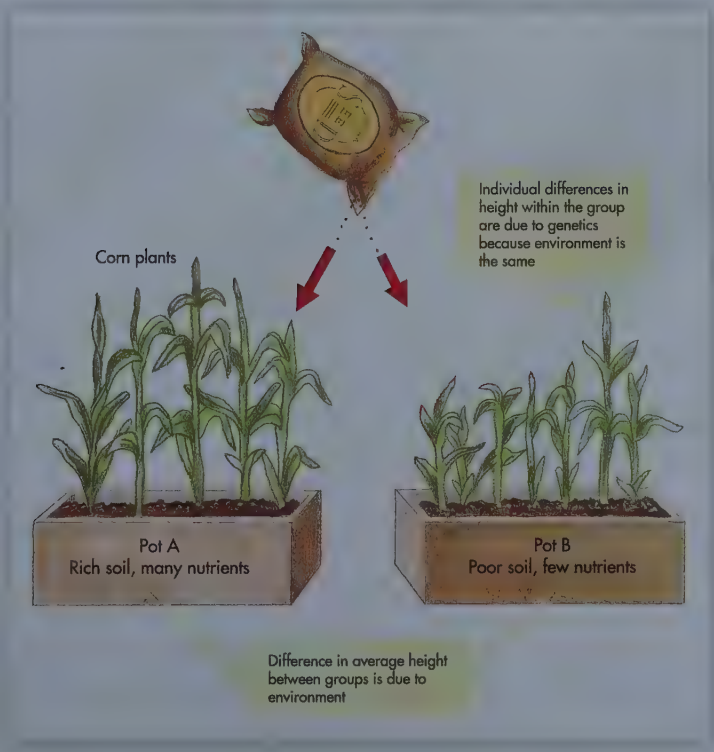


FIGURE 7.9 The Two Pots Analogy Because the two environments are very different, no conclusions can be drawn about possible overall genetic differences between the plants in pot A and the plants in pot B.

Because the seeds are not genetically identical, the plants *within group A* will vary in height. So will the plants *within group B*. Given that the environment (the soil) is the same for all the plants in one particular pot, this variation within each group of seeds is *completely* due to heredity—nothing differs but the plants' genes.

However, when we compare the average height of the corn plants in the two pots, pot A's plants have a higher average height than pot B's. Can the difference in these average heights be explained in terms of overall genetic differences between the seeds in each pot? No. The overall differences can be attributed to the two different environments, the good soil and the poor soil. In fact, because the environments are so different, it is impossible to estimate what the overall genetic differences are between the two groups of seeds.

Note also that even though, on the average, the plants in pot A are taller than the plants in pot B, some of the plants in pot B are taller than some of the plants in pot A. In other words, the average differences *within a group* of plants tell us nothing about whether an *individual* member of that group is likely to be tall or short.

The same point can be extended to the issue of average IQ differences between racial groups. Unless the environmental conditions of two racial groups are virtually identical, it is impossible to estimate the overall genetic differences between the two groups. Even if intelligence were *primarily* determined by heredity, which is not the case, IQ differences between groups could still be due entirely to the environment.

Other evidence for the importance of the environment in determining IQ scores derives from the improvement in average IQ scores that has occurred in several cultures and countries during the past few generations (Flynn, 2007a, 2007b; Neisser & others, 1996).

CULTURE AND HUMAN BEHAVIOR

Performing with a Threat in the Air: How Stereotypes Undermine Performance

Your anxiety intensifies as you walk into the testing center. You know how much you've prepared for this test. You should feel confident, but you can't ignore the nagging awareness that not everyone expects you to do well. Can your performance be influenced by your awareness of those expectations?

Standardized testing situations are designed so that everyone is treated as uniformly as possible. Nevertheless, some factors, such as the attitudes and feelings that individuals bring to the testing situation, can't be standardized. Among the most powerful of these factors are the expectations that you think other people might hold about your performance.

As psychologist **Claude Steele** (1997) discovered, if those expectations are negative, being aware of that fact can cause you to perform below your actual ability level. Steele coined the term **stereotype threat** to describe this phenomenon. It's a response that occurs when members of a group are aware of a negative stereotype about their group and fear they will be judged in terms of that stereotype. Even more unsettling is the fear that you might somehow confirm the stereotype, even when you know that the negative beliefs are false.

For example, one common stereotype is that women perform poorly in math, especially advanced mathematics. Multiple studies have shown that when women are reminded of their gender identity before taking an advanced mathematics test, their scores are lower than would be expected (see Steele & others, 2007). Even mathematically gifted women show a drop in scores when they are made aware of gender stereotypes (Good & others, 2008; Kiefer & Sekaquaptewa, 2007).

What about positive stereotypes, such as the racial stereotype that Asians are good at advanced mathematics? In a related phenomenon, called *stereotype lift*, awareness of *positive* expectations can actually improve performance on tasks (Walton & Cohen, 2003; Rydell & others, 2009).

Psychologist Margaret Shih and her colleagues (1999, 2006) showed how easily gender and racial stereotypes can be manipulated to affect test performance. In one study, mathematically gifted Asian-American female college students were randomly assigned to three groups. Group 1 filled out a questionnaire about their Asian background, designed to remind them of their Asian identity. Group 2 filled out a questionnaire designed to remind them of their female identity. Group 3 was the control group and filled out a neutral questionnaire.

The results? The students who were reminded of their racial identity as Asians scored significantly higher on the exam than the students who were reminded of their gender identity as women. The control group of female students who filled out the neutral questionnaire scored in the middle of the other two groups.

In another study, Shih and her colleagues (2006) assessed the performance of Asian-American women on a test of *verbal* ability, an area in which women are stereotypically expected to excel but Asians are not. In this study, the women scored *higher* on the verbal test when reminded of the *gender* identity, but scored *lower* on the test when reminded of their *racial* identity.

Members of virtually any group can experience a decline in performance due to stereotype threat (Schmader & others, 2008). For example:

- When a test was described as measuring "problem-solving skills," African-American students did just as well as white students. But when told that the *same* test measured "intellectual ability," African-American students scored lower than white students (Aronson & others, 2002; Steele & Aronson, 1995).

In a survey of intelligence test scores around the world, 14 nations were found to have shown significant gains in average IQ scores in just one generation (Flynn, 1994, 1999). The average IQ score in the United States has also steadily increased over the past century (Flynn, 2007a, 2007b; Weiss, 2010). Such changes in a population can be accounted for only by environmental changes because the amount of time involved is far too short for genetically influenced changes to have occurred.

stereotype threat A psychological predicament in which fear that you will be evaluated in terms of a negative stereotype about a group to which you belong creates anxiety and self-doubt, lowering performance in a particular domain that is important to you.

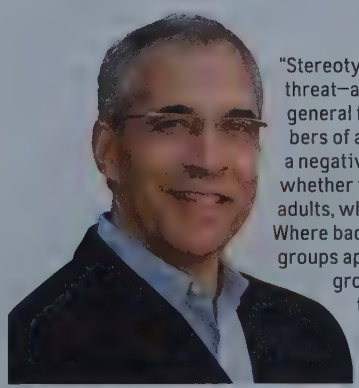
Cross-Cultural Studies of Group Discrimination and IQ Differences

The effect of social discrimination on intelligence test scores has been shown in numerous cross-cultural studies (see Ogbu, 1986, 2008). In many different societies, average IQ is lower for members of a discriminated-against minority group, even when that group is not racially different from the dominant group. The Culture and Human Behavior box explains how belonging to a stigmatized group can affect performance on tests of many different abilities.

Take the case of the Burakumin people of Japan. Americans typically think of Japan as relatively homogeneous, and indeed the Burakumin are not racially different from other Japanese. They look the same and speak the same language. However, the Burakumin are the descendants of an outcast group that for generations worked

- When reminded of their racial identity, white males did worse on a math test when they thought they were competing with Asian males (Aronson & others, 1999). And, when reminded of their gender identity, men performed worse than women on a test that was described as measuring "social sensitivity," but not when the test was described as measuring "complex information processing" (Koenig & Eagly, 2005).
- When tests were described as measuring intelligence, Hispanic students performed more poorly than white students (Gonzales & others, 2002); children from a low socioeconomic background performed more poorly than students from higher socioeconomic backgrounds (Croizet & Claire, 1998); and social science majors scored lower than natural science majors (Croizet & others, 2004).
- When reminded of the stereotype of the "elderly as forgetful," older adults scored lower on a memory test than did a matched group not given that reminder. Conversely, when reminded of the "elderly as wise" stereotype, senior adults scored *higher* on the same test than those who were not reminded of that positive stereotype (Levy, 1996).
- Women who were reminded of the stereotype that females are bad drivers were *more than twice as likely* to run over pedestrians than women who were *not* reminded of the stereotype (Yeung & Von Hippel, 2008). (Note from your authors: No actual pedestrians were harmed in this study, which was conducted in a driving simulator, not a real car.)

How does being reminded of a negative stereotype undermine a person's performance? First, there's the fear that you might confirm the stereotype, which creates psychological stress, self-doubt, and anxiety (Schmader & others, 2009). In turn, physiological arousal and distracting thoughts interfere with concentration, memory, and problem-solving abilities (Mrazek & others, 2011; Schmader, 2010). And, ironically, those individuals who are most highly motivated to perform well are the ones most likely to be affected by stereotype threat (Good & others, 2008).



"Stereotype threat is a situational threat—a threat in the air—that, in general form, can affect the members of any group about whom a negative stereotype exists, whether it's skateboarders, older adults, white men, or gang members. Where bad stereotypes about these groups apply, members of these groups can fear being reduced to that stereotype."

Claude Steele (1997)

Linda A. Cicero/Stanford News Service

Hundreds of psychological studies have demonstrated that individual performance on tests—even tests that are carefully designed to be fair and objective—is surprisingly susceptible to stereotype threat (Good & others, 2008; Kiefer & Sekaquaptewa, 2007; Walton & Spencer, 2009). However, research also shows that simply being aware of how stereotype threat can affect your performance helps minimize its negative effects (Johns & others, 2005, 2008; Nadler & Clark, 2011).



Masaru Goto/Global Compassion.com

Defying Centuries of Discrimination Members of the Buraku Liberation League sing a traditional Buraku lullaby on a rooftop in Japan. They chose a lullaby, the group's leader said, "to sing this as a song for protecting children while reflecting our suffering, sadness and wishes, all of which are conveyed in the song." Overt discrimination against the estimated 1 million Buraku people is technically illegal in Japan, yet they remain the poorest group in Japan and discrimination persists in employment, marriage, and other areas (Ikeda, 2001).

as tanners and butchers. Because they handled dead bodies and killed animals, the Burakumin were long considered unclean and unfit for social contact. For centuries, they were forced to live in isolated enclaves, apart from the rest of Japanese society (DeVos, 1992; DeVos & Wagatsuma, 1967).

Today, there are about 3 million Burakumin in Japan. Although the Burakumin were legally emancipated from their outcast status many years ago, substantial social discrimination against them persists (Ikeda, 2001; Payton, 1992). Because there is no way to tell if a Japanese citizen is of Burakumin descent, there are dozens of private detective agencies in Tokyo and other Japanese cities that openly specialize in tracking Burakumin who are trying to "pass" and hide their background. Until fairly recently, corporations in Japan openly consulted computer databanks to identify Burakumin who applied for jobs, as did individuals who wished to investigate the ancestral background of prospective marriage partners.

The Burakumin are the poorest people in Japan. They are only half as likely as other Japanese to graduate from high school or attend college. Although there are no racial differences between the Burakumin and the other Japanese, the average IQ scores of the Burakumin are well below those of other Japanese. As shown in Table 7.2, their average IQ scores are about 10 to 15 points below those of mainstream Japanese. But, when Burakumin families immigrate to the United States, they are treated like any other Japanese. The children do just as well in school—and on IQ tests—as any other Japanese Americans (Ogbu, 1986).

Of course, Japan is not the only society that discriminates against a particular social group. Many societies discriminate against specific minority groups, such as the Harijans in India (formerly called the untouchables), West Indians in Great Britain, Maoris in New Zealand, and Jews of non-European descent in Israel.

Children belonging to these minority groups score 10 to 15 points lower on intelligence tests than do children belonging to the dominant group in their societies. Children of the minority groups are often one or two years behind dominant-group children in basic reading skills and mathematical skills. Minority-group children are overrepresented in remedial programs and in school dropout rates. They are also underrepresented in higher education. The impact of discrimination on group differences in IQ remains even when the minority-group and dominant-group members are of similar socioeconomic backgrounds (Ogbu, 1986, 2008). In many ways, the educational experiences of these minority groups seem to parallel those of minority groups around the world, providing a cross-cultural perspective on the consistent effects of discrimination in many different societies.

TABLE 7.2

The Effects of Discrimination on IQ Scores in Japan

	Percentage of Children Scoring in a Given Range	
Range of IQ Scores	Non-Burakumin	Burakumin
Above 125	23.3	2.6
124–109	31.8	19.5
108–93	23.3	22.1
92–77	11.7	18.2
Below 76	9.9	37.6

Source: Adapted from DeVos & Wagatsuma (1967), Table 2, p. 261.

The Burakumin of Japan are not racially different from other Japanese, but they have suffered from generations of discrimination. Their average IQ scores are about 10 to 15 points below those of mainstream Japanese (Ogbu, 1986). In many other cultures, a similar gap in IQ scores exists between the discriminated-against minority and the dominant group.

Are IQ Tests Culturally Biased?

Another approach to explaining group differences in IQ scores has been to look at cultural bias in the tests themselves. If standardized intelligence tests reflect white, middle-class cultural knowledge and values, minority-group members might do poorly on the tests not because of lower intelligence, but because of unfamiliarity with the white, middle-class culture.

Researchers have attempted to create tests that are "culture-fair" or "culture-free." However, it is now generally recognized that it is virtually impossible to design a test that is completely culture-free. As cross-cultural psychologist Patricia Greenfield (1997) argues, ability tests "reflect the values, knowledge, and communication strategies of their culture of origin." Within that culture, the intelligence test may be a valid measure. Thus, a test will tend to favor the people from the culture in which it was developed.

Cultural differences may also be involved in *test-taking behavior* (Sternberg, 1995). People from different cultural backgrounds may use strategies in solving problems or organizing information that are different from those required on standard intelligence tests (Miller-Jones, 1989). In addition, such cultural factors as motivation, attitudes toward test taking, and previous experiences with tests can affect performance and scores on tests.



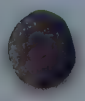
Commercial Eye/Getty Images

Testing, Testing, Testing . . . Virtually all college students will be evaluated with standardized tests at some point in their college careers. Although great pains are taken to make tests as unbiased and objective as possible, many factors, both personal and situational, can affect performance on tests. Cultural factors, familiarity with the testing process, and anxiety or nervousness are just a few of the factors that can skew test results. So perhaps the best way to view standardized tests is as just one of many possible indicators of a student's level of knowledge—and of his or her potential to learn.

CONCEPT REVIEW 7.3

Determinants of Intelligence

1. Most intelligence experts agree that observed differences in average IQ scores between racial groups are due to _____.
   a. genetic factors
   b. environmental factors
   c. the deliberate construction of biased tests
   d. the use of culture-free tests
2. A researcher tests a group of identical twins raised together and a different group of identical twins who were separated at birth and raised in different environments. She finds that the IQ scores of each pair of twins in the first group are more similar than are the IQ scores of each pair of twins in the second group. This difference between groups is the result of _____.
   a. genetic influences
   b. environmental influences
   c. neither environmental nor genetic influences
   d. an equal degree of environmental and genetic influences
3. One scoop of seeds is planted in a plot of farmland with rich soil and adequate rainfall. Another scoop of seeds from the same batch is planted in a backyard with poor soil that is never watered or fertilized. On the average, the seeds in the rich soil grow taller than the seeds in the poor soil. The difference between the average height of the plants in the rich soil and that of the plants in the poor soil is best accounted for by _____.
   a. genetic factors
   b. environmental factors
   c. 30 percent genetics and 70 percent environment
   d. 70 percent genetics and 30 percent environment
4. In question 3, the plants in the rich farmland vary in height. Some of the plants are taller than others. The same is true of the plants in the backyard. The differences in heights of the plants in the same plot of soil is best accounted for by _____.
   a. genetics
   b. environment
   c. 30 percent genetics and 70 percent environment
   d. 70 percent genetics and 30 percent environment



CLOSING THOUGHTS

So what conclusions can we draw about the debates surrounding intelligence, including the role of heredity in mental ability?

First, it's clear that the IQ score of any individual—regardless of his or her racial, social, or economic group—is the result of a complex interaction among genetic and environmental factors. Second, environmental factors are much more likely than genetic factors to account for average IQ differences among distinct groups of people (Ceci & Williams, 2009). Third, within *any* given group of people, IQ differences among people are due at least as much to environmental influences as they are to genetic influences (Plomin & Spinath, 2004). And finally, IQ scores reflect what IQ tests are designed to measure—a particular group of mental abilities.

■ **creativity** A group of cognitive processes used to generate useful, original, and novel ideas or solutions to problems.

As we've seen throughout this chapter, we draw on *many* different types of mental abilities to solve problems, adapt to our environment, and communicate with others. Our culture tends to define "intelligence" in terms of intellectual ability. However, as Tom's story in the prologue illustrates, social intelligence is an important ingredient in everyday life. Cognitive flexibility and creative thinking also contribute to our ability to successfully adapt to our particular environment. Can you learn to be more creative? We invite you to attend "A Workshop on Creativity" in the Enhancing Well-Being with Psychology section below.

ENHANCING WELL-BEING WITH PSYCHOLOGY

A Workshop on Creativity

Creativity can be defined as a group of cognitive processes used to generate useful, original, and novel ideas or solutions to problems (Hennessey & Amabile, 2010; Runco, 2007). Notice that usefulness, along with originality, is involved in judging creativity. An idea can be highly original, but if it lacks usefulness, it is not regarded as creative.

Although we typically think of creativity in terms of artistic expression, the act of creativity is almost always linked to the process of solving some problem. In that sense, creativity can occur in virtually any area of life.

Can you learn to be more creative? In general, creativity experts agree that you can. Although there is no simple formula that guarantees creative success, a few basic ingredients are central to the process of creative thinking. Here are several suggestions that can enhance your ability to think creatively.

1. Choose the goal of creativity.
Psychologists have found that virtually everyone possesses the intelligence and cognitive processes needed to be creative (Weisberg, 1988, 1993). But the creative individual values creativity as a personal goal. Without the personal goal of creativity, the likelihood of doing something creative is slim (Hennessey, 2010).

2. Reinforce creative behavior.
People are most creative when motivated by their own interest, the enjoyment of a challenge, and a personal sense of satisfaction and fulfillment (Amabile, 1996, 2001; Gilson & Madjar, 2010). This is called *intrinsic motivation.* In contrast, when people are motivated by external rewards, such as money or grades, they are displaying *extrinsic motivation.*

Researchers used to believe that extrinsic rewards made creative behavior much less likely. New research, however, seems to demonstrate that rewards can increase creative behavior in a person who has some training in generating creative solutions to problems (Eisenberger & others, 1998). When people know that creative behavior will be rewarded, they are more likely to behave in a creative way (Eisenberger & Cameron, 1996).

3. Engage in problem finding.
In many cases, the real creative leap involves recognizing that a problem exists. This is referred to as *problem finding* (Kaufman & Sternberg, 2010). We often overlook creative opportunities by dismissing trivial annoyances rather than recognizing them as potential problems to be solved.

For example, consider the minor annoyance experienced by a man named Art Fry. Fry, a researcher for 3M Corporation, regularly sang in his church choir. To locate the hymns quickly during the Sunday service, Fry used little scraps of paper to mark their places. But the scraps of paper would sometimes fall out when Fry stood up to sing, and he'd have to fumble to find the right page (Kaplan, 1990).


The New Yorker Collection, 2006, Leo Cullum. All rights reserved.

"Never, ever, think outside the box."

While sitting in church, Fry recognized the "problem" and came up with a relatively simple solution. If you put a substance that is sticky, but not *too* sticky, on the scraps of paper, they'll stay on the page and you can take them off when they are not needed anymore.

If you haven't already guessed, Art Fry invented Post-it notes. The formula for the adhesive had been discovered years earlier at 3M, but nobody could imagine a use for a glue that did not bond permanently. The mental set of the 3M researchers was to find *stronger* glues, not weaker ones. Fry's story demonstrates the creative value of recognizing problems instead of simply dismissing them.

A technique called *bug listing* is one useful strategy to identify potential problems. Bug listing involves creating a list of things that annoy, irritate, or bug you or other people. Such everyday annoyances are problems in need of creative solutions.

4. Acquire relevant knowledge.
Creativity requires a good deal of preparation (Weisberg, 1993). Acquiring a solid knowledge base increases your potential for recognizing how to creatively extend your knowledge or apply it in a new way. As the famous French chemist Louis Pasteur said, "Chance favors the prepared mind."

5. Try different approaches.
Creative people are flexible in their thinking. They step back from problems, turn them over, and mentally play with possibilities. By being flexible and imaginative, people seeking creative solutions generate



John Tlumacki/The Boston Globe via Getty Images

How to Build a Better Toy Box These graphic designers work for a toy company that is known for producing 'timeless' toys, like jack-in-the-boxes, tin trucks, and toy trains. Their job? To develop appealing packages for new toys—a task that requires imagination, technical expertise, and the ability to find new, creative solutions to old problems.

many different responses. This is called *divergent thinking* because it involves moving away (or diverging) from the problem and considering it from a variety of perspectives (Baer, 1993).

Looking for analogies is one technique to encourage divergent thinking. In problem solving, an *analogy* is the recognition of some similarity or parallel between two objects or events that are not usually compared. Similarities can be drawn in terms of the objects' operations, functions, purposes, materials, or other characteristics.

For example, consider inventor Dean Kamen's ingenious "self-balancing human transporter," the *Segway*, which is modeled on the human body. As Kamen (2001) explains, "There's a gyroscope that acts like your inner ear, a computer that acts like your brain, motors that act like your muscles, and wheels that act like your feet." Rather than brakes, engine, or steering wheel, sophisticated sensors detect subtle shifts in body weight to maintain direction, speed, and balance. Designed for riding on sidewalks, the Segway can move at speeds up to 17 mph and can carry the average rider for a full day.

6. Exert effort and expect setbacks.
Flashes of insight or inspiration can play a role in creativity, but they usually occur only after a great deal of work. Whether you're trying to write a brilliant term paper or design the next *Angry Birds* video game, creativity requires effort and persistence.

Finally, the creative process is typically filled with obstacles and setbacks. The best-selling novelist Stephen King endured years of rejection of his manuscripts before his first book was published. Thomas Edison tried thousands of filaments before he created the first working lightbulb. In the face of obstacles and setbacks, the creative person perseveres.

To summarize our workshop on creativity, we'll use the letters of the word *create* as an acronym. Thus, the basic ingredients of *creativity* are:

- Choose the goal of creativity.
- Reinforce creative behavior.
- Engage in problem finding.
- Acquire relevant knowledge.
- Try different approaches.
- Exert effort and expect setbacks.

CHAPTER REVIEW

Thinking, Language, and Intelligence

KEY POINTS

Introduction: Thinking, Language, and Intelligence

- **Cognition** refers to the mental activities involved in acquiring, retaining, and using knowledge.
- **Thinking** involves manipulating internal, mental representations of information in order to draw inferences and conclusions. Thinking often involves the manipulation of two kinds of mental representations: **mental images** and **concepts.**
- Most research has been done on visual mental images. We seem to treat mental images much as we do actual visual images or physical objects.
- Thinking also involves the use of concepts. **Formal concepts** are defined by logical rules. **Natural concepts** are likely to have fuzzy rather than rigid boundaries. We determine membership in natural concepts by comparing an object with our **prototype** for the natural concept or by comparing it to **exemplars** that we have stored in memory.

Solving Problems and Making Decisions

- **Problem solving** refers to thinking and behavior directed toward attaining a goal that is not readily available.
- Strategies commonly used in problem solving include **trial and error, algorithms,** and **heuristics.** Heuristics include breaking a problem into a series of subgoals and working backward from the goal. Sometimes problems are resolved through **insight** or **intuition.**
- **Functional fixedness** and **mental set** are two common obstacles to problem solving.
- Decision-making models include the single-feature model, the additive model, and the elimination by aspects model. Different strategies may be most helpful in different situations.
- When making risky decisions, we often use the **availability heuristic** and the **representativeness heuristic** to help us estimate the likelihood of events.

Language and Thought

- **Language** is a system for combining arbitrary symbols to produce an infinite number of meaningful statements.
- Language has the following characteristics: Meaning is conveyed by arbitrary symbols whose meaning is shared by speakers of the same language; language is a rule-based system; language is generative; and language involves displacement. Language influences thinking by affecting our perceptions of others.
- Animals communicate with members of their own species, sometimes in a complex fashion. Some can also be taught to communicate with humans. Bonobos and dolphins seem to have demonstrated an elementary grasp of the rules of syntax. **Animal cognition** is an active field of research in comparative psychology.

Measuring Intelligence

- **Intelligence** can be defined as the global capacity to think rationally, act purposefully, and deal effectively with the environment. Intelligence tests are designed to measure general mental abilities.
- Alfred Binet developed the first widely accepted intelligence test, which incorporated the idea of **mental age** that was different from a chronological age. Binet did not believe that intelligence was inborn or fixed nor that it could be described by a single number.
- Lewis Terman adapted Binet's test for use in the United States and developed the concept of the **intelligence quotient,** or **IQ** score. Terman believed that success in life was primarily determined by IQ.
- Group intelligence tests were developed for screening military recruits during World War I.
- David Wechsler developed the Wechsler Adult Intelligence Scale (WAIS), which included scores on subtests that measured different mental abilities. Wechsler also changed the method of calculating overall IQ scores.
- **Achievement tests** and **aptitude tests** are two types of psychological tests. Psychological tests must meet the requirements of **standardization, reliability,** and **validity.** The norms, or standards, for intelligence tests follow the **normal curve,** or **normal distribution,** of scores.

The Nature of Intelligence

- Debate over the nature of intelligence centers on two key issues: (1) whether intelligence is a single factor or a cluster of different abilities and (2) how narrowly intelligence should be defined.
- Charles Spearman believed that intelligence could be described as a single factor, called **general intelligence,** or the ***g* factor.**
- Louis L. Thurstone believed that there were seven primary mental abilities.
- Howard Gardner believes that there are multiple intelligences. He defines *intelligence* as the ability to solve problems or create products that are valued within a cultural setting.
- Robert Sternberg's **triarchic theory of intelligence** emphasizes both the universal aspects of intelligence and the importance of adapting to a particular cultural environment. He identifies three forms of intelligence: analytic, creative, and practical intelligence.
- The IQ of any individual is the result of a complex interaction between heredity and environment. Intelligence is not determined by a single gene, but by the interaction of multiple genes.
- Twin studies are used to determine the degree to which genetics contributes to complex characteristics such as intelligence. **Heritability** refers to the percentage of variation within a given population that is due to heredity. Within a given racial group, the effects of environment and genetics are roughly equal.
- There are differences in the average IQ scores for different racial groups. However, there is more variation within a particular group than there is between groups.
- Although it is possible to calculate the differences within a given group that are due to heredity, it is not possible to calculate the differences between groups that are due to heredity. Unless the environments are identical, no comparisons can be drawn. Rather than genetic factors, environmental factors are more likely to be the cause of average IQ differences among groups.
- Cross-cultural studies have demonstrated that the average IQ scores of groups subject to social discrimination are frequently lower than the average IQ scores of the dominant social group, even when the groups are not racially different.
- Intelligence tests can be culturally biased. All intelligence tests reflect the culture in which they are developed. Cultural factors may also influence test-taking behavior and individual performance. IQ scores reflect only selected aspects of intelligence.

KEY TERMS

cognition, p. 277
thinking, p. 277
mental image, p. 277
concept, p. 278
formal concept, p. 279
natural concept, p. 280
prototype, p. 280
exemplars, p. 280
problem solving, p. 281
trial and error, p. 281
algorithm, p. 282
heuristic, p. 282
insight, p. 283
intuition, p. 283
functional fixedness, p. 284
mental set, p. 284
availability heuristic, p. 287
representativeness heuristic, p. 287
language, p. 289
linguistic relativity hypothesis, p. 290
animal cognition, or comparative cognition, p. 293
intelligence, p. 294
mental age, p. 294
intelligence quotient (IQ), p. 295
achievement test, p. 297
aptitude test, p. 297
standardization, p. 297
normal curve (normal distribution), p. 297
reliability, p. 298
validity, p. 298
g factor (general intelligence), p. 299
triarchic theory of intelligence, p. 301
autism, p. 302
Asperger's syndrome, p. 302
mental retardation, p. 302
heritability, p. 306
stereotype threat, p. 308
creativity, p. 312

KEY PEOPLE

Alfred Binet (1857–1911) French psychologist who, along with French psychiatrist Théodore Simon, developed the first widely used intelligence test. (p. 294)

Howard Gardner (b. 1943) Contemporary American psychologist whose theory of intelligence states that there is not one intelligence, but multiple independent intelligences. (p. 299)

Charles Spearman (1863–1945) British psychologist who advanced the theory that a general intelligence factor, called the *g* factor, is responsible for overall intellectual functioning. (p. 299)

Claude Steele (b. 1946) American social psychologist best known for his work on stereotype threat. (p. 308)

Robert Sternberg (b. 1949) Contemporary American psychologist whose *triarchic theory of intelligence* identifies three forms of intelligence (analytic, creative, and practical). (p. 301)

Lewis Terman (1877–1956) American psychologist who translated and adapted the Binet-Simon intelligence test for use in the United States; he also began a major longitudinal study of the lives of gifted children in 1921. (p. 295)

Louis L. Thurstone (1887–1955) American psychologist who advanced the theory that intelligence is composed of several primary mental abilities and cannot be accurately described by an overall general or *g* factor measure. (p. 299)

David Wechsler (1896–1981) American psychologist who developed the Wechsler Adult Intelligence Scale, the most widely used intelligence test. (p. 296)

CONCEPT REVIEW ANSWERS

7.1 page 287

1. heuristic
2. insight (O = one, T = two, etc.)
3. trial and error
4. algorithm
5. availability heuristic
6. single-feature model
7. representativeness heuristic

7.2 page 304

1. Sternberg
2. Binet
3. Wechsler
4. Spearman
5. Gardner
6. Thurstone
7. Terman

7.3 page 311

1.b 2.b 3.b 4.a



Web Companion Review Activities

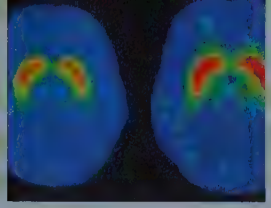
You can find additional review activities at www.worthpublishers.com/hockenbury6e

The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.

CHAPTER 8

Motivation and Emotion





One Step at a Time

PROLOGUE

"COFFEE?" THE WAITER ASKED. "No, thanks," Randy said. "Do you have any green tea?"

Surprised, Don asked, "You're not drinking coffee?" Randy's capacity for coffee was legendary.

"I'm trying to clean up my act," Randy replied. "I quit coffee three weeks ago, cigarettes two weeks ago, and last week I joined a health club."

"And what motivated you to make all these changes?"

"I'm going to run this year's Tulsa Run," Randy explained matter-of-factly.

Don looked at Randy with a deadpan expression. "The Tulsa Run? Let me get this straight, Randy. You quit smoking and joined a health club so you can run nine miles in a race with 10,000 other runners. Why?!"

Randy smiled his trademark, funny little smile, the one that usually means he's thinking about four steps ahead of you. "To see if I can do it," he explained.

"Got'cha," Don said, nodding. "So, tell me, does Sara feel like she's dating a whole new guy?"

"I hope Sara *is* dating a whole new guy," Randy replied, his facial expression tensing as he glanced down at the menu. "Sara and I broke up last month."

Now it was Don's turn to glance away as he considered the unexpected comment.

After a moment, Don quietly said, "I'm sorry to hear that, Randy. I know that you and Sara were having . . ."

"Nothing to be sorry about," Randy interrupted. "I just got to the point that I couldn't handle her emotional swings anymore. She was just so unpredictable. Actually, Don, I'm relieved that it's over."

"You want to talk about it?"

"We just did," Randy said, and smiled again, ready to change topics. "Have you still got that book on running?"

"Sure, you want to borrow it?"

It was early May when that conversation took place. The Tulsa Run happens every year on the last Saturday in October. That meant that Randy had about five months to train for the race. His training began very slowly at first, largely because he had no choice but to start slowly. He could jog about half a block before he was gasping for breath. After regaining his breath, he'd jog another half a block. Nonetheless, Randy would jog/walk about three miles a day.

IN THIS CHAPTER:

- Introduction: Motivation and Emotion
- Motivational Concepts and Theories
  - Biological Motivation: Hunger and Eating
  - Psychological Needs as Motivators
  - Emotion
- Theories of Emotion: Explaining Emotion
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Turning Your Goals into Reality



Eduardo Contreras/San Diego Union-Tribune/Zuma Press/Newscom

Motivation: What Makes Them Run? Every year, thousands of people compete in the grueling 9.3-mile Tulsa Run—and 26-mile marathons around the country. Why do they do it? Motivation researchers study the "why" of human behavior—the forces that motivate an individual to act.

By late June, Randy had made significant progress and crossed an important threshold. He could jog a mile before he had to stop and catch his breath. Don assumed that Randy would abandon his Tulsa Run goal by midsummer, when the sweltering Tulsa heat makes running at any time of day uncomfortable. But Randy persevered. He switched to a morning routine, arriving at the River Parks jogging trail around 6:00 A.M. His new girlfriend, Linda, bicycled alongside Randy as he plodded along the scenic trails. By mid-July, Randy's confidence soared as he passed another threshold. He could jog two miles nonstop.

In early September, Randy ran in his first official race—a three-mile run. Although he had to walk briefly during the middle of the race, he finished with an average time of about nine minutes per mile. And in all fairness, it was pretty impressive for a guy who couldn't even jog a block three months earlier.

In early October, Randy twisted his ankle while running, and Don was certain Randy's Tulsa Run goal would finally evaporate. It didn't. Instead, Randy worked out at the health club, "running" in the swimming pool as his ankle healed. Less than two weeks later, he was back on the jogging path, Linda riding along beside him.

The last Saturday in October finally arrived. As the starting gun sounded on that glorious fall morning, some 10,000 runners surged forward to cover 9.3 miles. Randy was somewhere in the throng of runners. The professional runners, of course, always win the race with extraordinary times. So what are all the other runners trying to accomplish? Many of them are trying to achieve a personal "best" time. Regular local runners are often trying to improve their standing in their age and gender categories. And many people, like Randy, are simply trying to prove that they can do it.

Randy's personal goal was to finish the Tulsa Run in eight-minute miles or better—the ambitious goal he had set for himself back in May. Although Randy had never run more than six miles at a time in all of his training, he was certain he could finish the Tulsa Run. And finish he did. In the final stretch of the Tulsa Run, Randy flat out sprinted the last four blocks, blazing across the finish line at 1 hour, 14 minutes, and 10 seconds. His average time? *Exactly* eight minutes per mile.

It is impossible to capture in words the exhilaration that Randy felt on that Saturday. He was on an emotional high for the rest of the weekend. His sense of achievement was complete: He had set a very challenging goal for himself, worked toward it literally one step at a time, and attained it.



Introduction: Motivation and Emotion

KEY THEME

› Motivation refers to the forces acting on or within an organism to initiate and direct behavior.

KEY QUESTIONS

› What three characteristics are associated with motivation?

› How is emotion related to the topic of motivation?

"Something" energized Randy's behavior, moving him not just to start jogging but also to make sweeping changes in his life. For that matter, "something" inspired you to pick up this text, so that you are reading these words right now. And, going a step further, "something" moved us to write these words.

That "something" is what the topic of **motivation** is about—the biological, emotional, cognitive, or social forces that act on or within you, initiating and directing your behavior. Typically, psychologists don't measure motivation directly. Instead, some type of motivation is *inferred* when an organism performs a particular behavior, such as curiosity motivating exploratory behavior or hunger motivating eating behavior. Indeed, the forces that activate your behavior can take many different forms, including biological, psychological, or social forces.

motivation The biological, emotional, cognitive, or social forces that activate and direct behavior.

instinct theories The view that certain human behaviors are innate and due to evolutionary programming.

As an explanatory concept, motivation is very useful in both the scientific sense and the everyday sense. In conversations, people routinely use the word *motivation* to understand or explain the "why" behind the behavior of others. "And what motivated you to take up hang gliding?" "She is so motivated to get her pilot's license that she started going to the library every night to study for the written exam." Such statements reflect three basic characteristics commonly associated with motivation: activation, persistence, and intensity.

Activation is demonstrated by the initiation or production of behavior, such as Randy's initiating his daily training to prepare for the Tulsa Run. *Persistence* is demonstrated by continued efforts or the determination to achieve a particular goal, often in the face of obstacles. Despite scorching summer heat and an injury, Randy never wavered in his dogged determination to accomplish the goal he had set for himself. Finally, *intensity* is seen in the greater vigor of responding that usually accompanies motivated behavior. In Randy's case, he pursued his goal with considerable intensity, practicing harder and longer as the date of the Tulsa Run approached.

Motivation is closely tied to emotional processes, and vice versa. Often we are motivated to experience a particular emotion, such as feeling proud. In turn, the experience of an emotion—such as love, fear, or dissatisfaction—can motivate us to take action. Many forms of motivation have an emotional component, which is involved in the initiation and persistence of behavior. One reflection of the emotional intensity of Randy's motivation was the exhilaration he experienced when he finally achieved the goal he had set for himself.

In the second half of the chapter, we'll take a detailed look at emotion. As you'll see, *emotion* is a psychological state involving three distinct components: a subjective experience, a physiological response, and a behavioral or expressive response.


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"Could you give me a little push?"

Motivational Concepts and Theories

KEY THEME

› Over the past century, instinct, drive, incentive, arousal, and humanistic theories have been proposed to explain the general principles of motivation.

KEY QUESTIONS

› How does each theory explain motivation?

› What were the limitations of each theory?

› What lasting ideas did each theory contribute to the study of motivation?

During the twentieth century, several broad theories of motivation were proposed. Each model eventually proved to be limited, explaining only certain aspects of motivation. However, key ideas and concepts from each model became essential to a complete understanding of motivation and were incorporated into newer theories (Fiske, 2008; Forbes, 2011). As you'll see in this section, the concepts used to explain motivation have become progressively more diverse over the years.

Instinct Theories

Inborn Behaviors as Motivators

In the late 1800s, the fledgling science of psychology initially embraced instinct theories to explain motivation. According to **instinct theories,** people are motivated to engage in certain behaviors because of evolutionary programming. Just as animals display automatic and innate instinctual behavior patterns called *fixed action patterns,* such as migration or mating rituals, human behavior was also thought to be motivated by inborn instinctual behavior patterns.

Inspired by Charles Darwin's (1859, 1871) landmark theory of evolution, early psychologists like William James and William McDougall (1908) devised lists of human instincts. Table 8.1 lists some of the human instincts that William James (1890) included in his famous text, *Principles of Psychology.*

TABLE 8.1

James's List of Human Instincts

Attachment	Resentment
Fear	Curiosity
Disgust	Shyness
Rivalry	Sociability
Greediness	Bashfulness
Suspicion	Secretiveness
Hunting	Cleanliness
Play	Modesty
Shame	Love
Anger	Parental Love

In his famous text, *Principles of Psychology,* William James (1890) devoted a lengthy chapter to the topic of instinct. With an air of superiority, James noted that "no other mammal, not even the monkey, shows so large an array of instincts" as humans. The table shows some of the human instincts identified by James.

drive theories The view that behavior is motivated by the desire to reduce internal tension caused by unmet biological needs.

homeostasis (home-ee-oh-STAY-sis) The idea that the body monitors and maintains internal states, such as body temperature and energy supplies, at relatively constant levels; in general, the tendency to reach or maintain equilibrium.

drive A need or internal motivational state that activates behavior to reduce the need and restore homeostasis.

incentive theories The view that behavior is motivated by the pull of external goals, such as rewards.

arousal theory The view that people are motivated to maintain a level of arousal that is optimal—neither too high nor too low.

sensation seeking The degree to which an individual is motivated to experience high levels of sensory and physical arousal associated with varied and novel activities.

By the early 1900s, thousands of instincts had been proposed in one expert's list or another to account for just about every conceivable human behavior (Bernard, 1924). (The early instinct theorists were, no doubt, motivated by a "listing instinct.") But what does it mean to say that an assertive person has a "self-assertion instinct"? Or to say that our friend Randy had a "jogging instinct"? The obvious problem with the early instinct theories was that merely describing and labeling behaviors did not explain them.

By the 1920s, instinct theories had fallen out of favor as an explanation of human motivation primarily because of their lack of explanatory power. But the more general idea that some human behaviors are innate and genetically influenced remained an important element in the overall understanding of motivation. Today, psychologists taking the *evolutionary perspective* consider how our evolutionary heritage may influence patterns of human behaviors, such as eating behaviors or the expression of emotions. We'll consider what the evolutionary perspective has to say about both of those examples later in the chapter.

Drive Theories

Biological Needs as Motivators

Beginning in the 1920s, instinct theories were replaced by **drive theories.** In general, drive theories asserted that behavior is motivated by the desire to reduce internal tension caused by unmet biological needs, such as hunger or thirst. The basic idea was that these unmet biological needs "drive" or "push" us to behave in certain ways that will lead to a reduction in the drive. When a particular behavior successfully reduces a drive, the behavior becomes more likely to be repeated when the same need arises again.

Leading drive theorists, including psychologists Robert S. Woodworth (1918, 1921) and Clark L. Hull (1943, 1952), believed that drives are triggered by the internal mechanisms of homeostasis. The principle of **homeostasis** states that the body monitors and maintains relatively constant levels of internal states, such as body temperature, fluid levels, and energy supplies. If any of these internal conditions deviates very far from the optimal level, the body initiates processes to bring the condition back to the normal or optimal range. Thus, the body automatically tries to maintain a "steady state," which is what *homeostasis* means.



Sharon King Grimm

Motivation and Drive Theories
According to drive theories of motivation, behavior is motivated by biological drives to maintain *homeostasis*, or an optimal internal balance. After a long soccer practice on a hot day, these high school students are motivated to rest, cool off, and drink water. Drive theories of motivation are useful in explaining biological motives like hunger, thirst, and fatigue, but are less useful in explaining psychological motives. For example, how could we explain their motivation to play competitive soccer? To practice long and hard on a hot summer day?

According to drive theorists, when an internal imbalance is detected by homeostatic mechanisms, a **drive** to restore balance is produced. The drive activates behaviors to reduce the need and to reestablish the balance of internal conditions. For example, after you have not eaten anything for several hours, this unmet biological need creates a *drive state*—hunger—that motivates or energizes your behavior. And how might the drive of hunger energize you to behave? You might make your way to the kitchen and forage in the refrigerator for some leftover guacamole or chocolate cake.

Today, the drive concept remains useful in explaining motivated behaviors that clearly have biological components, such as hunger, thirst, and sexuality. However, drive theories also have limitations. Let's consider hunger again. Is the motivation of eating behavior strictly a matter of physiological need? Obviously not. People often eat when they're not hungry and don't eat when they are hungry. And how could drive theories account for the motivation to buy a lottery ticket or run a marathon?

Incentive Motivation

Goal Objects as Motivators

Building on the base established by drive theories, incentive theories emerged in the 1940s and 1950s. **Incentive theories** proposed that behavior is motivated by the "pull" of external goals, such as rewards, money, or recognition. It's easy to think of

many situations in which a particular goal, such as a promotion at work, can serve as an external incentive that helps activate particular behaviors.

Incentive theories drew heavily from well-established learning principles, such as *reinforcement*, and the work of influential learning theorists, such as Pavlov, Watson, Skinner, and Tolman (see Chapter 5). Edward Tolman (1932) also stressed the importance of cognitive factors in learning and motivation, especially the *expectation* that a particular behavior will lead to a particular goal.

When combined, drive and incentive theories account for a broad range of the "pushes" and "pulls" motivating many of our behaviors. But even in combination, drive and incentive explanations of motivation still had limitations. In some situations, such as playing a rapid-response video game, our behavior seems to be directed toward *increasing* tension and physiological arousal. If you think about it, our friend Randy's decision to take up running was not motivated by either an internal, biological drive or an external incentive.

Arousal Theory

Optimal Stimulation as a Motivator

Racing your car along a barren stretch of highway, watching a suspenseful movie, shooting down the Super Slide at a water park—none of these activities seem to involve tension reduction, the satisfaction of some biological need, or the lure of some reward. Rather, performing the activity itself seems to motivate us. Why?

Arousal theory is based on the observation that people experience both very high levels of arousal and very low levels of arousal as being quite unpleasant. When arousal is too low, we experience boredom and become motivated to *increase* arousal by seeking out stimulating experiences (Berlyne, 1960, 1971). But when arousal is too high, we seek to *reduce* arousal in a less stimulating environment. Thus, people are motivated to maintain an *optimal* level of arousal, one that is neither too high nor too low (Hebb, 1955). This optimal level of arousal varies from person to person, from time to time, and from one situation to another.

That the optimal level of arousal varies from person to person is especially evident in people dubbed *sensation seekers*. Sensation seekers find the heightened arousal of novel experiences very pleasurable. According to psychologist Marvin Zuckerman (1979, 2007, 2009), people who rank high on the dimension of **sensation seeking** have a need for varied, complex, and unique sensory experiences. No doubt your author Don ranks high on this dimension, since he has tried skydiving, aerobatic flying, and white-water rafting. (He also once ate a handful of biodegradable packing peanuts, much to the horror of a college secretary.) Although such experiences can sometimes involve physical or social risks, sensation seekers aren't necessarily drawn to danger—but rather to the novel experience itself. For example, college students who study abroad score significantly higher on sensation seeking than college students who stay in their country of origin (Schroth & McCormack, 2000).



James W. Kay/Newscom

Extreme Skiing Aptly called "extreme sports," they include such diverse activities as hang gliding, ice climbing, white-water kayaking, bungee jumping, and parachuting from mountain cliffs and radio towers. People who enjoy such high-risk activities are usually sensation seekers. For them, the rush of adrenaline they feel when they push the outer limit is an exhilarating and rewarding experience.

Like people, animals also seem to seek out novel environmental stimulation. Rats, cats, dogs, and other animals actively explore a new environment. In a series of classic studies, psychologist Harry Harlow (1953a, 1953b) showed that a monkey will spend hours trying to open a complicated lock, even when there is no incentive or reward for doing so. And, when kept in a boring cage, a monkey will "work" for the opportunity to open a window to peek into another monkey's cage or to watch an electric train run (Butler & Harlow, 1954).



Harlow Primate Laboratory, University of Wisconsin

Seeking Stimulation Like humans, animals are also motivated to seek out stimulation and explore novel environments. In his research with monkeys, Harry Harlow (1953c) found that arousal was a powerful motive. These young monkeys are trying to open a complicated lock, despite the lack of an incentive or reward for their behavior.

humanistic theories of motivation The view that emphasizes the importance of psychological and cognitive factors in motivation, especially the notion that people are motivated to realize their personal potential.

Humanistic Theory

Human Potential as a Motivator

In the late 1950s, **humanistic theories of motivation** were championed by psychologists Carl Rogers and Abraham Maslow. Although not discounting the role of biological and external motivators, humanistic theories emphasized psychological and cognitive components in human motivation (Sheldon, 2008). Motivation was thought to be affected by how we perceive the world, how we think about ourselves and others, and our beliefs about our abilities and skills (Rogers, 1961, 1977).

According to the humanistic perspective, people are motivated to realize their highest personal potential. Although the motivation to strive for a positive self-concept and personal potential was thought to be inborn, humanistic theories also recognized the importance of the environment (Maslow, 1970). Without a supportive and encouraging environment—personal, social, and cultural—the motivation to strive toward one's highest potential could be jeopardized (King, 2008). Later in the chapter, we'll consider the most famous humanistic model of motivation, Maslow's *hierarchy of needs.*

Not one man in a billion, when taking his dinner, ever thinks of utility. He eats because the food tastes good and makes him want more.

—*William James* Principles of Psychology *(1890)*

In the next several sections, we'll look at several basic motives, starting with the fundamentally biological motive of hunger and the behavior of eating. Later, we'll consider psychological motives, including competence and achievement motivation. As you'll see, the motivation concepts of drive, homeostasis, incentive, and arousal all come into play in understanding many different human behaviors.

Biological Motivation

Hunger and Eating

KEY THEME

› Hunger is a biological motive, but eating behavior is motivated by a complex interaction of biological, social, and psychological factors.

KEY QUESTIONS

› What is energy homeostasis, and how does it relate to energy balance?

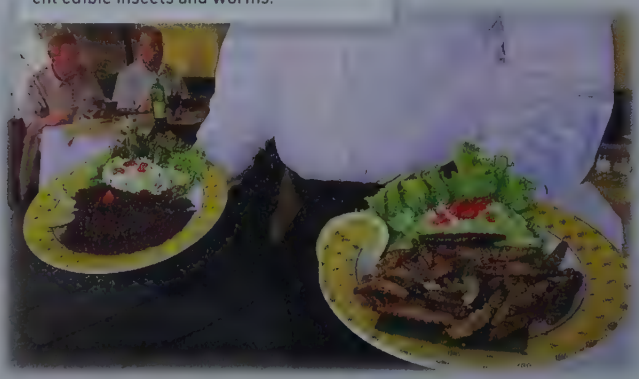
› What are the short-term signals that regulate eating behavior?

› What chemical signals are involved in the long-term regulation of a stable body weight?

› How do set-point and settling-point theories differ?

It seems simple: You're hungry, so you eat. But even a moment's reflection will tell you that eating behavior is not that straightforward. When, what, how much, and how often you eat is influenced by an array of psychological, biological, social, and cultural factors.

Delicious or Disgusting? The need to eat is a universal human motive. However, culture influences *what* we eat, *when* we eat, and *how* we eat (Rozin, 1996, 2007). This upscale restaurant in Mexico City serves *chapulines* (grasshoppers, left) and *gusanos del maguey* (caterpillars). High in protein and readily available, insects are standard fare in many countries, including Mexico, whose traditional cuisine includes recipes for more than 500 different edible insects and worms.



JORGE UZON/AFP/Newscom

For example, think about what you ate yesterday. Now contrast your choices with food preferences in other cultures. A typical diet for the Dusan of northern Borneo in Southeast Asia includes anteater, gibbon (a small ape), snake, mouse, and rat meat. After these meats have spoiled to the point of being liquefied, the Dusan consume them with rice. South American Indians eat head lice, bees, iguanas, and monkeys. The Guianese of South America eat pebbles as a regular part of their diet, while the Vedda of Sri Lanka like rotted wood (see Fieldhouse, 1986). Clearly, cultural experience shapes our food choices (Rozin, 2006, 2007).

Themes of food and eating permeate many different dimensions of our lives. Psychologically, eating can be related to emotional states, such as depression, anxiety, or stress (Evers &

others, 2010; Macht & Simons, 2011). Interpersonally, eating is often used to foster relationships, as when you have friends over for dinner or take a potential customer to lunch. We often rely on food-related adjectives to describe other people, as when we say that someone has a *sweet disposition* or a *sour outlook* on life. Interestingly, our judgments about others may be influenced by what they eat (Vartanian & others, 2007). And, how much we eat can be influenced by those around us (Salvy & others, 2007).

In the next several sections, we look at what researchers have learned about the motivational factors that trigger hunger and eating behavior. As you'll see, these research efforts have focused on answering several key questions:

- What signals regulate the motivation to start and stop eating?
- How do people maintain a stable body weight over time?
- Why do people become overweight or obese?
- What causes eating disorders?

glucose Simple sugar that provides energy and is primarily produced by the conversion of carbohydrates and fats; commonly called *blood sugar.*

insulin Hormone produced by the pancreas that regulates blood levels of glucose and signals the hypothalamus, regulating hunger and eating behavior.

basal metabolic rate (BMR) When the body is at rest, the rate at which it uses energy for vital functions, such as heartbeat and respiration.

adipose tissue Body fat that is the main source of stored, or reserve, energy.

energy homeostasis The long-term matching of food intake to energy expenditure.

Energy Homeostasis

Calories Consumed = Calories Expended

In order to explain the regulation of hunger and eating behavior, we need to begin with some basics on how food is converted to energy in the body. The food that you eat is broken down by enzymes and gradually absorbed in your intestines. As part of this process, food is converted into amino acids, fatty acids, and simple sugars, providing "fuel" for your body. The simple sugar **glucose,** commonly called *blood sugar,* provides the main source of energy for all mammals, including humans. In the liver, glucose is converted to and stored as *glycogen,* which can be easily converted back to glucose for energy. The hormone **insulin,** secreted by the pancreas, helps control blood levels of glucose and promotes the uptake of glucose by the muscles and other body tissues. Insulin also helps in regulating eating behavior and maintaining a stable body weight.

About one-third of your body's energy is expended for the routine physical activities of daily life, such as walking, lifting objects, brushing your teeth, and digesting the food you eat. The remaining two-thirds of your body's energy is used for continuous bodily functions that are essential to life, such as generating body heat, heartbeat, respiration, and brain activity. When you are lying down and resting, the rate at which your body uses energy for vital body functions is referred to as your **basal metabolic rate (BMR).**

Obviously, you have to eat in order to have sufficient immediate energy for vital body functions and to survive. But another reason you eat is to maintain a reserve of stored energy. **Adipose tissue,** or body fat, is the main source of stored calories. Your liver, which monitors glucose levels in your bloodstream, can utilize this stored energy if necessary.

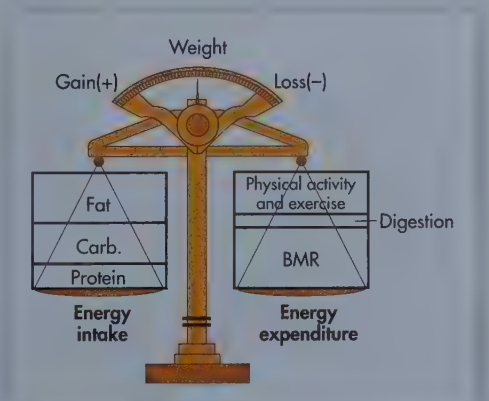


FIGURE 8.1 Energy Balance The tendency of our bodies to maintain a stable body weight is well documented (Schwartz & others, 2000). Maintaining a stable body weight occurs when you experience *energy balance*—that is, when the calories you take in almost exactly match the calories you expend for physical activity and metabolism.

Source: Adapted from Ravussin & Danforth (1999).

Positive Versus Negative Energy Balance

For most of us, there is considerable daily variation in what, when, how often, and how much we eat. Yet despite this day-to-day variability in eating behavior, our body weight, including our stores of body fat, tends to stay relatively constant over the course of weeks, months, and even years (Bessesen, 2011). Your typical or average body weight is called your *baseline body weight.*

A regulatory process called **energy homeostasis** helps you maintain your baseline body weight. Over time, most people experience *energy balance* (see Figure 8.1). This means that the number of calories you consume almost exactly matches the number of calories you expend for energy. The result is that your body weight, including body fat stores, tends to remain stable.

However, energy balance can become disrupted if you eat more or less food than you need. If your caloric intake exceeds the amount of calories expended for energy, you experience *positive energy balance.* When there is more glucose

ghrelin (GRELL-in) Hormone manufactured primarily by the stomach that stimulates appetite and the secretion of growth hormone by the pituitary gland.

positive incentive value In eating behavior, the anticipated pleasure of consuming a particular food; in general, the expectation of pleasure or satisfaction in performing a particular behavior.

satiation (say-she-AY-shun) In eating behavior, the feeling of fullness and diminished desire to eat that accompanies eating a meal; in general, the sensation of having an appetite or desire fully or excessively satisfied.

cholecystokinin (CCK) (kola-sis-tow-KINE-in) Hormone secreted primarily by the small intestine that promotes satiation; also found in the brain.

than your body needs for its energy requirements, the excess glucose is converted into reserve energy—fat. If positive energy balance persists over time, the size and number of the body fat cells that make up the adipose tissue increase. Conversely, if you diet or fast, *negative energy balance* occurs: Caloric intake falls short of the calories expended for energy. If this imbalance continues, body fat stores shrink as the reserve energy in fat cells is used for physical activity and metabolic functions.

These findings imply that energy homeostasis and a stable body weight are actively regulated by internal signals and mechanisms that influence eating behavior. But what exactly are these signals or mechanisms?

Short-Term Signals That Regulate Eating

Consuming food is so routine in our lives that most of us don't really think about what motivates us to stop what we're doing and begin eating. Psychologists and other researchers, however, are very motivated to answer that question. In the past few years, they've made important new discoveries about the physiological and psychological factors involved in the motivation to eat (Strubbe & Woods, 2004).

Physiological Changes That Predict Eating

The idea that some internal, biochemical factor triggers our desire to eat makes intuitive sense. But what? Many people believe that eating is triggered by a drastic drop in blood glucose levels, which are rapidly restored by food consumption. This popular belief is *not* accurate. Actually, your blood levels of glucose and fats fluctuate very little over the course of a typical day. However, about 30 minutes before you eat, you experience a *slight* increase in blood levels of insulin and a *slight* decrease in blood levels of glucose. In experimental studies with both humans and rats, these small changes reliably predict the initiation of eating (Chaput & Tremblay, 2009).

Once the meal is begun, blood glucose levels return to their baseline level. Interestingly, glucose returns to its baseline level well *before* the food is actually digested and absorbed. And, in fact, glucose will return to its baseline level even if you do *not* eat (see Figure 8.2).

A more important internal signal is a new hormone discovered by Japanese researcher Masayasu Kojima and his colleagues in 1999. **Ghrelin** (pronounced GRELL-in) is primarily manufactured by cells lining the stomach. It stimulates the secretion of growth hormone by the pituitary gland in the brain (Kojima & others, 1999, 2011; Olszweski & others, 2008).

Ghrelin was quickly dubbed "the hunger hormone" when research showed that it strongly stimulates appetite. When rats were deprived of food, ghrelin levels increased sharply (see Inui, 2001). More directly, rats whose brains were continuously infused with ghrelin ate voraciously and gained weight. When ghrelin receptors were blocked, their eating behavior subsided (Nakazato & others, 2001; Tschöp & others, 2000).

What about people? Researcher Donald Cummings and his colleagues (2002, 2006) showed that ghrelin is involved in the short-term regulation of eating behavior. As you can see in Figure 8.3, blood levels of ghrelin rise sharply before and fall abruptly after meals. Cummings also found that ghrelin seems to be involved in the long-term regulation of energy balance and weight. When participants in one of his studies lost weight by dieting, their overall plasma levels of ghrelin—and feelings of hunger—increased.

Two other internal factors are correlated with meal onset—body temperature and metabolism rate. Prior to eating, body temperature increases and metabolism decreases. As the meal is consumed, this internal physiological pattern reverses: Body temperature decreases and metabolism increases (LeBlanc, 2000). This slight post-eating decrease in body temperature might explain why some people, including about a third of our students, occasionally feel cold after eating a meal.

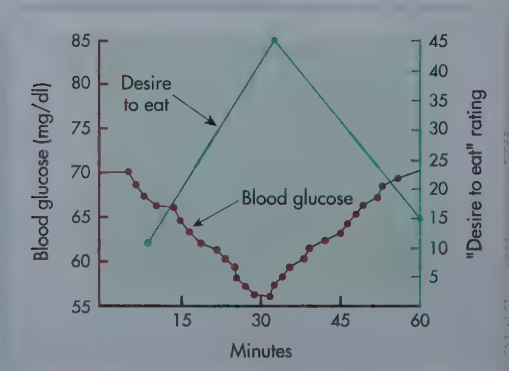


FIGURE 8.2 Blood Glucose and the Motivation to Eat In this graph, the red dots depict the effects of insulin triggering a small decline in blood glucose over the course of about 30 minutes. As blood glucose decreases, the person's subjective desire to eat increases sharply, depicted by the green line. Notice that although this person did not eat, his blood glucose level returned to normal within the hour and his desire to eat diminished. In daily life, a small decline in blood glucose level is one of the factors that reliably predict our motivation to eat.

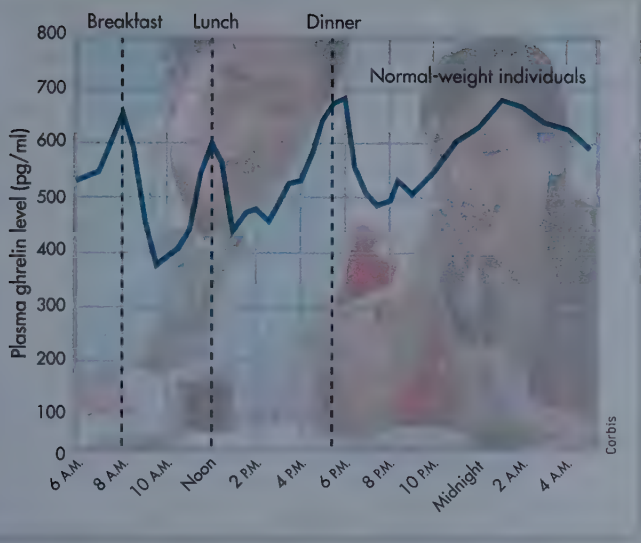
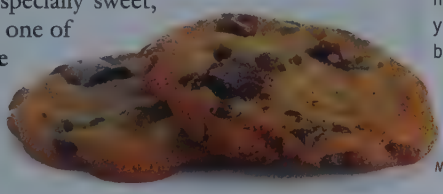


FIGURE 8.3 Ghrelin: The Hunger Hormone
The recently discovered hormone named *ghrelin* is manufactured primarily by the stomach and stimulates appetite (Nakazato & others, 2001). The graph shows the average plasma levels of ghrelin for 10 normal-weight individuals over the course of 24 hours. Ghrelin levels rise shortly before eating, precipitating feelings of hunger. During and shortly after the meal, ghrelin levels, and feelings of hunger, fall (Cummings & others, 2002). So, if your stomach is ghrelin, you must be hungry!

Psychological Factors That Trigger Eating

In Chapter 5, we described *classical conditioning* and *operant conditioning*. Both forms of conditioning can affect your eating behavior. For example, in much the same way as Pavlov's dogs were conditioned to salivate at the sound of a bell, your eating behavior has probably been influenced by years of classical conditioning. The time of day at which you normally eat (the *conditioned stimulus*) elicits reflexive internal physiological changes (the *conditioned response*), such as the changes in blood levels of insulin, glucose, and ghrelin, increased body temperature, and decreased metabolism. In turn, these internal physiological changes increase your sense of hunger. Other stimuli, such as the setting in which you normally eat or just the sight of food utensils, can also become associated with the anticipation of eating (Davidson, 2000).

Operant conditioning and *positive reinforcement* play a role in eating, too. Voluntary eating behaviors are followed by a *reinforcing stimulus*—the taste of food. Granted, not all foods are equally reinforcing. Because of prior reinforcement experiences, people develop preferences for certain tastes, especially sweet, salty, and fatty tastes. In other words, foods with one of these tastes hold greater **positive incentive value** for some people. Hence, your motivation to eat is influenced by prior learning experiences that have shaped your expectations, especially the anticipated pleasure of eating certain foods.



Is Your Mouth Watering? Does the sight of these freshly baked chocolate chip cookies make you feel hungry? Some foods have a strong positive incentive value. Even if you've just eaten a large meal, the reinforcing value of a chocolate-chip cookie might tempt you to keep eating. Although you might not have been particularly hungry before you read this page, looking at this photograph might send you to the kitchen in search of a sweet snack—which is exactly what happened to your authors!

Michael Guttman/iStockphoto

Satiation Signals

Sensing When to Stop Eating

The feeling of fullness and diminished desire to eat that accompanies eating a meal is termed **satiation.** Several signals combine to help trigger satiation. One satiation signal involves *stretch receptors* in the stomach that communicate sensory information to the brainstem. The sensitivity of the stomach stretch receptors is increased by a hormone called **cholecystokinin,** thankfully abbreviated **CCK.** During meals, cholecystokinin is secreted by the small intestines and enters the bloodstream. In the brain, CCK acts as a neurotransmitter. Many studies have shown that CCK promotes satiation and reduces or stops eating (Delzenne & others, 2010). CCK also magnifies the satiety-producing effects of food in the stomach by slowing the rate at which the stomach empties.

sensory-specific satiety (sah-TIE-it-tee) The reduced desire to continue consuming a particular food.

leptin Hormone produced by fat cells that signals the hypothalamus, regulating hunger and eating behavior.

neuropeptide Y (NPY) Neurotransmitter found in several brain areas, most notably the hypothalamus, that stimulates eating behavior and reduces metabolism, promoting positive energy balance and weight gain.

Psychological factors play a role in satiation, too. As you eat a meal, there is a decline in the positive incentive value of any available food, but especially the specific foods you are eating. So, after you have wolfed down four slices of pizza, the pizza's appeal begins to diminish. This phenomenon is termed **sensory-specific satiety** (Havermans & others, 2009; Maier & others, 2007). Of course, if a *different* appealing food becomes available, your willingness to eat might return. Restaurants are well aware of this, which is why servers will bring a tempting platter of scrumptious desserts to your table after you've finished a large and otherwise satisfying dinner.

Long-Term Signals That Regulate Body Weight

In the past decade, researchers have discovered numerous different chemical messengers that monitor and help us maintain a stable body weight over time (Morton & others, 2006; Powley, 2009). Three of the best-documented internal signals are *leptin, insulin,* and *neuropeptide Y.*

Leptin is a hormone secreted by the body's adipose tissue into the bloodstream. The amount of leptin that is secreted is directly correlated with the amount of body fat. The brain receptor sites for leptin are located in several areas of the hypothalamus. Neurons in the stomach and the gut also have leptin receptor sites.

Leptin is a key element in the feedback loop that regulates energy homeostasis. Under conditions of positive energy balance, the body's fat stores increase, and so do blood levels of leptin. When the leptin level in the brain increases, food intake is reduced and the body's fat stores shrink over time. Increased leptin levels also intensify the satiety-producing effects of CCK, further decreasing the amount of food consumed (Matson & others, 2000). Should negative energy balance occur, fat stores shrink and there is a corresponding decrease in leptin blood levels, which triggers eating behavior.

The hormone *insulin* is also involved in brain mechanisms controlling food intake and body weight. Like leptin, the amount of insulin secreted by the pancreas is directly proportional to the amount of body fat. In the brain, insulin receptors are located in the same hypothalamus areas as leptin receptors (Brüning & others, 2000). Increased brain levels of insulin are also associated with a reduction in food intake and body weight. So in much the same way as leptin, insulin levels vary in response to positive or negative energy balance, triggering an increase or decrease in eating.

Abbreviated **NPY, neuropeptide Y** is a neurotransmitter manufactured throughout the brain, including the hypothalamus. During periods of negative energy balance and weight loss, decreased leptin and insulin levels promote the secretion of NPY by the hypothalamus (Powley, 2009). In turn, increased brain levels of neuropeptide Y trigger eating behavior, reduce body metabolism, and promote fat storage. Conversely, if positive energy balance and weight gain occur, neuropeptide Y activity decreases.

In combination, the long-term and short-term eating-related signals we've discussed provide a feedback loop that is monitored by the hypothalamus (see Figure 8.4). As the hypothalamus detects changes in leptin, insulin, neuropeptide Y, ghrelin, CCK, and other internal signals, food intake and BMR are adjusted to promote or hinder weight



_Ob/ob_ Mice, Before and After Leptin Leptin is a hormone produced by body fat. Because of a genetic mutation, these mice, dubbed *ob/ob* mice, lack the ability to produce leptin. Consequently, *ob/ob* mice behave as though their brains were telling them that their body fat reserves are completely depleted and that they are starving. *Ob/ob* mice have voracious appetites and five times as much body fat as normal-weight mice. Yet they display the characteristics of starving animals, including decreased immune system functioning, low body temperatures, and lack of energy. When the *ob/ob* mouse on the right was given supplemental leptin, it lost the excess fat and began eating normally. Its body temperature, immune system, and metabolism also became normal (Friedman & Halaas, 1998). Unfortunately, what worked for obese mice has not worked as easily for obese people, although researchers remain hopeful (Morrison, 2008).

Rami Banali/Liaisen

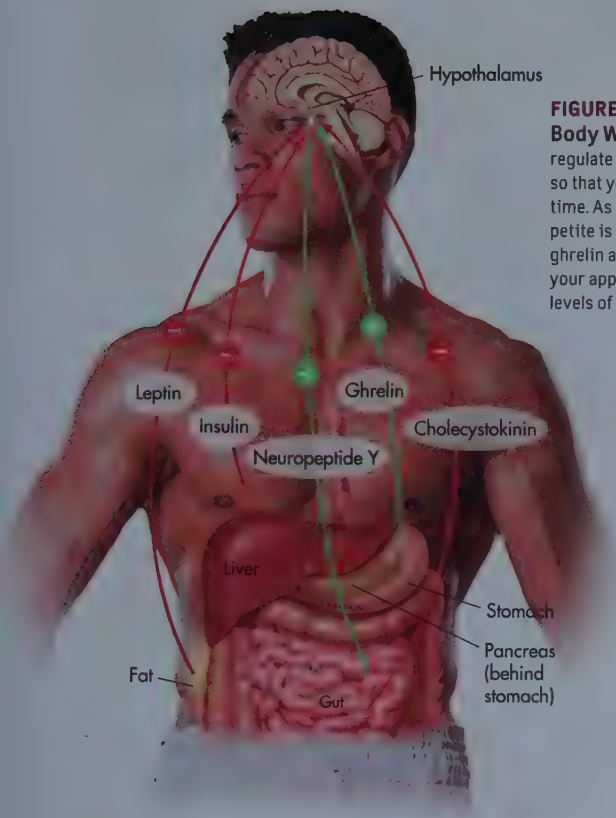


FIGURE 8.4 Regulating Appetite and Body Weight Multiple signals interact to regulate your appetite and energy expenditure so that you maintain a stable body weight over time. As summarized in this drawing, your appetite is stimulated (+) by increased levels of ghrelin and neuropeptide Y. On the other hand, your appetite is suppressed (-) by increased levels of leptin, insulin, and CCK.

gain. The end result? Over the course of time, energy balance is achieved. Your average body weight stays stable because the number of calories you consume closely matches the number of calories you expend for energy. Or, at least, that's how it's supposed to work.

Eating and Body Weight Over the Lifespan

Set Point or Settling Point?

So far we've discussed the regulation of eating in terms of the energy balance model, which is the essence of a popular theory called *set-point theory*. According to **set-point theory,** the body has a natural or optimal weight, called the *set-point weight,* that it is set to maintain. Much like a thermostat set to a particular temperature, your body vigorously defends this set-point weight from becoming lower or higher by regulating feelings of hunger and body metabolism (Major & others, 2007).

Set-point theory helps explain why body weight tends to be stable for extended periods of time. However, it's obvious that baseline body weight doesn't always remain fixed at an optimal level throughout the lifespan. Instead, many, if not most, people tend to drift to a heavier average body weight as they get older. But why? According to set-point theory, if food intake increases, metabolic rate and hunger should change to compensate for the increased calories so as to maintain a consistent body weight. But obviously, this is not always the case.

Settling-point models of weight regulation provide an alternate view that seems to better explain this tendency (see Pinel & others, 2000). According to settling-point models of weight regulation, your body weight tends to "settle" around the point at which equilibrium is achieved between energy expenditure and food consumption. Your *settling-point weight* will stay relatively stable as long as the factors influencing food consumption and energy expenditure don't change. However, if these factors do change, creating positive or negative energy balance, you will drift to a higher or lower settling-point body weight. In the next few sections, we'll consider some of the factors that contribute to the upward drift of body weight.

■ **set-point theory** Theory that proposes that humans and other animals have a natural or optimal body weight, called the *set-point weight,* that the body defends from becoming higher or lower by regulating feelings of hunger and body metabolism.

■ **settling-point models of weight regulation** General model of weight regulation suggesting that body weight settles, or stabilizes, around the point at which there is balance between the factors influencing energy intake and energy expenditure.

body mass index (BMI) A numerical scale indicating adult height in relation to weight; calculated as (703 × weight in pounds)/(height in inches)^2.

obese Condition characterized by excessive body fat and a body mass index equal to or greater than 30.0.

Excess Weight and Obesity

KEY THEME

› Many different factors contribute to the high rates of overweight and obesity in the United States and other countries.

KEY QUESTIONS

› What is BMI?

› What factors contribute to excess weight and obesity?

From buses to billboards, movies and magazines to MTV, images of beautiful people are everywhere. They come in a vast variety of ethnicities, wardrobes, and poses, but the beautiful people have one thing in common: They are *thin.* Without question, the "thin ideal" is pervasive in American culture. In fact, over the past decades, actresses, models, Miss America Pageant winners, *Playboy* centerfolds, and even cartoon characters have become progressively thinner (Grabe & others, 2008).

But there is an enormous gap between the cultural *ideal* of a slender body and the cultural *reality* of the expanding American waistline. Far from conforming to the "thin ideal," more than two-thirds of American adults and almost one-third of children are above their healthy weight (Levi & others, 2011).

How is healthy weight determined? For statistical purposes, the most widely used measure of weight status is **body mass index,** abbreviated **BMI.** For adults, the body mass index provides a single numerical value that reflects your weight in relation to your height (see Figure 8.5). A healthy BMI falls between 18 and 25. Generally, people with a BMI between 25 and 29.9 are considered *overweight,* unless their high BMI is due to muscle or bone rather than fat. Thus, it is possible to have a high BMI and still be very healthy, as are many athletes or bodybuilders. In contrast, people who are **obese** have a BMI of 30 or greater *and* an abnormally high proportion of body fat.

Let's break down the statistics on obesity and overweight. More than one-third of the adult U.S. population is considered to be overweight. But another third of adults—over 72 million people—are considered medically obese, weighing in with a BMI of 30 or above (Levi & others, 2011). Beyond the United States, rapidly increasing rates of obesity have become a global health problem. One and a half billion adults are overweight, and about 500 million of these are clinically obese (World Health Organization, 2011).

As people age, they tend to gain excess weight. The percentage of overweight people increases throughout adulthood, peaking in the fifth and sixth decades of life. However, excess weight is also a problem in early life. Over 17 percent of U.S. children and adolescents are obese. Even more unsettling, about 10 percent of 2- to 5-year-olds—that's one out of every ten preschoolers—is obese (Ogden & Carroll, 2010).

FIGURE 8.5 Calculating Your BMI: Where Do You Weigh In?

The **body mass index**, or **BMI**, is one measure of weight status. The BMI provides a single numerical value that represents your height in relation to your weight. To determine your BMI, grab a calculator and follow these steps:

Step 1. Multiply your weight in pounds by 703 _____

Step 2. Square your height in inches _____

Step 3. Divide step 1 by step 2 _____ This is your BMI.

If your BMI is:	You are:
18.4 or below	Underweight
18.5 to 24.9	Healthy weight
25.0 to 29.9	Overweight
30.0 and above	Obese

Source: Centers for Disease Control and Prevention (2009).

Factors Involved in Becoming Overweight

At the simplest level, the only way you can become overweight is if your caloric intake consistently exceeds your energy expenditure—the essence of *positive energy balance.* So the critical question is this: What kinds of factors are creating positive energy balance for so many people?

Too Little Sleep: Disrupting Hunger Hormones Multiple studies have shown that going without adequate sleep disrupts the hunger-related hormones leptin and ghrelin (Taheri & others, 2004). In one study, the sleep of healthy young men was restricted to just four hours a night for two nights. In response, blood levels of the appetite-suppressing hormone leptin fell by 18 percent and the appetite-increasing hormone ghrelin soared by 24 percent. This significantly increased feelings of hunger, especially for foods with high carbohydrate content (Spiegel & others, 2004). Other research has shown that adults who sleep only about five hours a night are 50 percent more likely to be obese (Gangwisch, 2004).

CRITICAL THINKING

Has Evolution Programmed Us to Overeat?

Could eating less help you live longer? Numerous correlational studies of humans and experiments with rodents and Rhesus monkeys have consistently come to the same conclusion: Eating a restricted but balanced diet produces a variety of health benefits and promotes longevity (Fontana & others, 2011). So if eating a calorically restricted but balanced diet confers numerous health benefits and promotes longevity, *why* do so many people overeat?



Layne Kennedy/Corbis

University of British Columbia psychologists John P. J. Pinel, Sunaina Assanand, and Darrin R. Lehman (2000) believe that the evolutionary perspective provides several insights. For animals in the wild, food sources are often sporadic and unpredictable. When animals do find food, competition for it can be fierce, even deadly. If an animal waited to eat until it was hungry and its energy reserves were significantly diminished, it would run the risk of starving or falling prey to another animal.

Thus, the eating patterns of many animals have evolved so that they readily eat even if not hungry (Berthoud, 2007; Zheng & others, 2009). Overeating when food is available ensures ample energy reserves to survive times when food is *not* available.

For most people living in food-abundant Western societies, foraging for your next meal is usually about as life-threatening as waiting your turn in the Taco Bell drive-through lane. According to Pinel and his colleagues, people in food-rich societies do *not* eat because they are hungry or because their bodies are suffering from depleted energy resources. Rather, we are enticed by the anticipated pleasure of devouring that supersize burrito or calzone. In other words, we are motivated to eat by the *positive incentive value* of highly palatable foods.

When a food with a high positive incentive value is readily available, we eat, and often overeat, until we are satiated by that specific taste, which is termed *sensory-specific satiety.* Should another food with high positive incentive value become available, we continue eating and overconsume (Mok, 2010). As noted in the text, this is referred to as the *cafeteria diet effect.* From the evolutionary perspective, there is adaptive pressure to consume a variety of foods. Why? Because consuming a varied diet helps promote survival by ensuring that essential nutrients, vitamins, and minerals are obtained.

But unlike our ancient ancestors scrounging through the woods for seeds, fruits, and vegetables to survive, today's humans are confronted with foraging for burgers, cheese fries, and Oreo McFlurries. Therein lies the crux of the problem. As Pinel and his colleagues (2000) explain, "The increases in the availability of high positive-incentive value foods that have occurred over the past few decades in industrialized nations—increases that have been much too rapid to produce adaptive evolutionary change—have promoted levels of ad libitum consumption that are far higher than those that are compatible with optimal health and long life."

CRITICAL THINKING QUESTIONS

- Look back at the section on motivation theories. How might each theory (instinct, drive, incentive, arousal, and humanistic) explain the behavior of overeating?
- How might the insights provided by the evolutionary explanation be used to resist the temptation to overeat?

Positive Incentive Value: Highly Palatable Foods Rather than being motivated by hunger, we are often enticed to eat by the *positive incentive value* of the available foods and the anticipated pleasures of consuming those highly palatable foods (Epstein & others, 2007; Carr & Epstein, 2011). Did someone say Ben and Jerry's ice cream?

The "Supersize It" Syndrome: Overeating In the past two decades, average daily caloric intake has increased nearly 10 percent for men and 7 percent for women (Piernas & Popkin, 2011). Every day, we are faced with the opportunity to overeat at all-you-can-eat buffets and fast-food restaurants that offer to supersize your portions for only a few cents more.

The Cafeteria Diet Effect: Variety = More Consumed If variety is the spice of life, it's also a surefire formula to pack on the pounds. Offered just one choice or the same old choice for a meal, we consume less. But when offered a variety of highly palatable foods, such as at a cafeteria or an all-you-can-eat buffet, we consume more (Epstein & others, 2010). This is sometimes called the **cafeteria diet effect.**

Sedentary Lifestyles One recent study of almost 300,000 people living in 76 countries found that approximately 1 in 5 persons worldwide leads a sedentary lifestyle, engaging in less than 30 minutes of moderate activity on most days of

■ **cafeteria diet effect** The tendency to eat more when a wide variety of palatable foods is available.

the week (Dumith & others, 2011). Sedentary lifestyles were more common in urbanized, developed countries than in less developed or more rural countries. The problem is even worse in the United States. Four out of 10 American adults report that they *never* exercise, play sports, or engage in physically active hobbies like gardening or walking the dog (National Center for Health Statistics, 2000b).

BMR: Individual Differences and Lifespan Changes Not everyone who overeats gains excess weight. One reason is that people vary greatly in their basal metabolic rate, which accounts for about two-thirds of your energy expenditure. On average, women have a metabolic rate that is 3 to 5 percent lower than men's. Metabolism also decreases with age. Body metabolism is highest during growth periods early in the lifespan (see Figure 8.6). After declining sharply between infancy and early adulthood, BMR decreases more slowly, by about 2 to 3 percent per decade of life. As your BMR decreases with age, less food is required to meet your basic energy needs. Consequently, it's not surprising that many people, upon reaching early adulthood, must begin to watch how much they eat.

Of the six factors we've covered here, you can exert control over five of them—all except BMR—to counteract becoming or remaining overweight. The bad news is that if people don't exercise control, all six factors can contribute to becoming obese.

Factors Involved in Obesity

Especially in the past decade, there has been intensive research investigating the causes of obesity—and for good reason. Health care costs directly attributable to obesity exceed $60 *billion* a year (Friedman, 2009). Regardless of how it develops, a BMI of 30 or above has life-threatening consequences (Abdullah & others, 2011). Annually, about 300,000 adult deaths in the United States are *directly* attributable to obesity. Several variables derail the normal mechanisms of energy homeostasis in obesity (see Friedman, 2009). In this section, we'll summarize some of those factors.

The Interaction of Genetics and Environment Current research suggests that multiple genes on multiple chromosomes are involved in creating susceptibility to obesity (Barsh & others, 2000; Friedman, 2009). People with a family history of obesity are two to three times more likely than people with no such family history to become obese. And, the more closely related two people are genetically, the more likely they are to have similar body mass indexes.

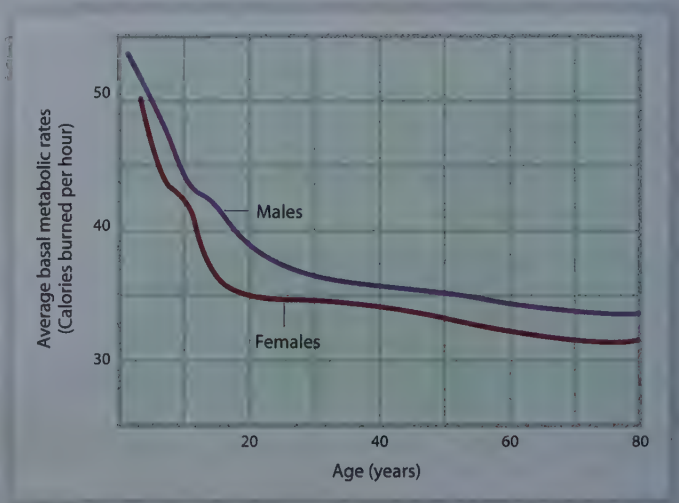


FIGURE 8.6 Age and Gender Differences in Metabolism From infancy through adolescence, there is a steep decline in the rate at which your body uses energy for vital functions, such as heartbeat, breathing, and body heat. Your BMR continues to decrease by about 2 to 3 percent during each decade of adulthood. At all points in the lifespan, women's metabolic rate is 3 to 5 percent lower than men's.

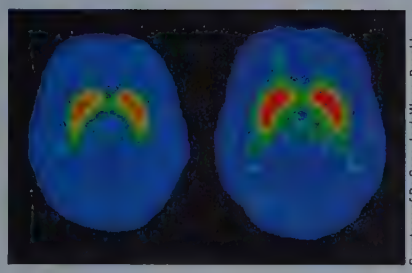
Source: Stuart & Davis (1972).

FOCUS ON NEUROSCIENCE

Dopamine Receptors and Obesity

Eating to Stimulate Brain Reward?

In Chapter 2, we noted that dopamine brain pathways are involved in the reinforcing feelings of pleasure and satisfaction. In Chapter 4, we also noted that many addictive drugs produce their pleasurable effects by increasing brain dopamine levels. These pleasurable effects are most reinforcing in people who have low levels of dopamine brain receptors (Volkow & others, 2007, 2011). Given that eating can be highly reinforcing and produces pleasurable sensations, could the same mechanisms also play a role in obesity?



Courtesy of Dr. Gene-Jack Wang, Brookhaven National Laboratory

Obese Normal

In a landmark study, researchers injected obese and normal-weight individuals with a chemical "tag" that binds to brain dopamine receptors. PET scans detected where the chemical tag bound with dopamine receptors, shown in red. The two PET scans reveal significantly fewer dopamine receptors for obese individuals (left) as compared to the normal-weight control subjects (right). And, among the obese people in the study, the number of dopamine receptors decreased as BMI increased (Wang & others, 2001, 2004). Another study found that genetically obese, leptin-deficient rats had significantly lower numbers of dopamine receptors than normal, lean rats (Thanos & others, 2008.) Thus, it could be that compulsive or binge eating compensates for reduced dopamine function by stimulating the brain's reward system (Volkow & Wise, 2005).

But is the lower number of dopamine receptors a cause or a consequence of obesity? Researchers are getting closer to understanding the relationship between obesity and the brain's reward system. In a recent study, one group of rats was allowed to eat as much as they wanted of rat chow—a nutritionally complete but boring diet (Johnson & Kenny, 2010). Another group of rats, genetically identical to the first group, was offered a "cafeteria diet" of high-fat, sugary foods that are freely available in the modern American diet: sausage, bacon, cheesecake, poundcake, chocolate, and frosting.

The rats on the junk-food diet rapidly became overweight, eating up to twice as many calories as the rats fed only the boring rat chow. And, the rats soon started acting like, well, junkies. They refused nutritious, low-calorie food. They became compulsive eaters, and, like drug addicts seeking a high despite negative consequences, they would eat the junk food even when it was paired with a mild electric shock.

Even more interesting was what happened to the rats' brain chemistry. Much like the brain changes associated with drug addiction, dopamine response in the junk-food-addicted rats was significantly reduced. In other words, rats who pigged out (so to speak) on sugary, fatty foods experienced the same changes in brain chemistry that are associated with addiction to drugs like cocaine, heroin, and alcohol.

But what about humans? A new study provides powerful evidence that overeating can lead to brain changes in humans, too. Neuroscientist Eric Stice and his colleagues (2010) used fMRI to scan the brains of overweight women while they drank a rich chocolate milkshake. Six months later, the women returned to the lab and repeated the experience. Some of the women had gained a few pounds, and others had not. The researchers found that there was no difference in the response to the milkshake in the women whose weight had remained stable. But women who had gained weight showed a significant reduction in the response of their brain reward system to the milkshake. And, there was a direct, negative correlation to the amount of weight gained and the brain reward response. The more weight the women gained, the greater the reduction in dopamine response to the milkshake as compared to six months previously.

Unlike the rats in the junk food study, these women were overweight to begin with, so it may not be possible to generalize the findings to people who are of normal weight. Nonetheless, the implication is clear: Obesity can be a vicious cycle. People eat more to compensate for reduced brain rewards, but overeating reduces the dopamine reward system levels even further. These findings help explain why people continue to overeat despite suffering the unhealthy consequences of obesity.

But genetics is *not* necessarily destiny. About 30 percent of the time, obese children have obese parents. However, obesity also occurs about 30 percent of the time among children with parents who are of normal weight (Bouchard, 1997).

The key phrase here is *susceptibility to obesity*. Even though someone may be genetically predisposed to obesity, environmental factors still play a role. If an individual is genetically susceptible and lives in a high-risk environment, obesity is more likely to occur. And what constitutes a high-risk environment for obesity? An environment characterized by ample and easily obtainable high-fat, high-calorie, palatable foods. A real-world example of this interaction is shown in Figure 8.7 on the next page. As countries develop stable economies and food supplies, the prevalence of obesity rapidly escalates.

Leptin Resistance Having greater fat stores, most obese people have high blood levels of leptin. So why don't these high blood levels of the leptin hormone reduce eating behavior and induce weight loss? Many obese people experience **leptin resistance,** in which the normal mechanisms through which leptin regulates body

■ **leptin resistance** A condition in which higher-than-normal blood levels of the hormone leptin do not produce the expected physiological response.

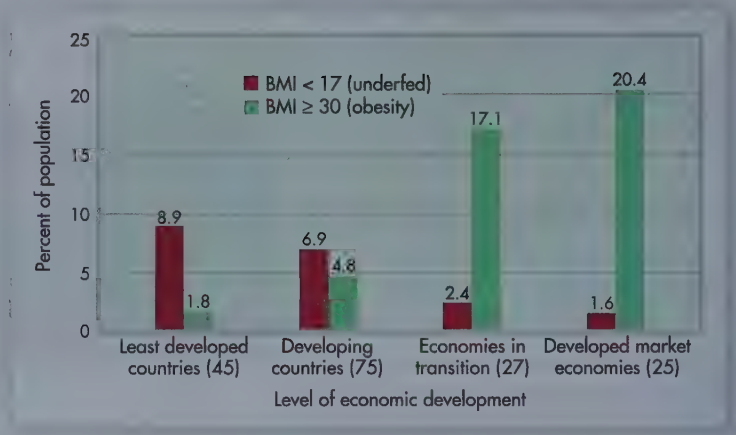


FIGURE 8.7 Genetic Susceptibility and Environmental Conditions If different populations have similar percentages of people who are genetically susceptible to obesity, then the critical factor becomes environmental conditions. In a low-risk environment, the availability of food, especially high-calorie foods, is limited. In countries with poorly developed economies and food supplies, the prevalence of underfed people (BMI < 17) is higher than the prevalence of obesity (BMI > 30). But in countries with established or well-developed economies, such as most Western countries, food is plentiful and easily attainable, creating high-risk conditions for obesity. In highly developed market economies, obesity rates have soared.

Sources: Barsh & others (2000); World Health Organization (2001).

weight cycling Repeated cycles of dieting, weight loss, and weight regain; also called *yo-yo dieting*.

weight and energy balance are disrupted (Enriori & others, 2006; Morrison, 2008). Although leptin levels are high in the blood, they are often low in the obese person's cerebrospinal fluid. This suggests that leptin is not sufficiently transported from the blood to the brain. One possibility is that the obese person's high blood levels of leptin are overwhelming the transport system to the brain.

Dieting: BMR Resistance to Maintaining Weight Loss Any diet that reduces caloric intake will result in weight loss. The difficult challenge is to maintain the weight loss. Many overweight or obese dieters experience **weight cycling,** or *yo-yo dieting*—the weight lost through dieting is regained in weeks or months and maintained until the next attempt at dieting.

One reason this occurs is because the human body is much more effective at vigorously defending against weight *loss* than it is at protecting against weight *gain* (Keel & others, 2007). As caloric intake is reduced and fat cells begin to shrink, the body actively defends against weight loss by decreasing metabolism rate and energy level. With energy expenditure reduced, far fewer calories are needed to maintain the excess weight. In effect, the body is using energy much more efficiently. If dieters continue to restrict caloric intake, weight loss will plateau in a matter of weeks. When they go off the diet, their now more energy-efficient bodies quickly utilize the additional calories, and they regain the weight they lost.

CONCEPT REVIEW 8.1

Motivational Concepts and Eating Behavior

True or false?

_____ 1. Because they had so much difficulty trying to identify human behaviors that might be instinctual, early psychologists abandoned instinct theories as an explanation of human motivation.

_____ 2. Whereas drive theories "pull" us to behave in certain ways, incentive theories describe the motivational "push" of external goals.

_____ 3. Studies with both humans and nonhuman animals have shown that lower-than-normal brain levels of leptin are correlated with sensation-seeking behavior.

_____ 4. The basal metabolic rate tends to gradually decrease throughout adulthood.

_____ 5. There has been virtually no change in the average daily caloric intake of U.S. males and females over the last two decades.

_____ 6. Research by comparative psychologists has shown that most wild animals eat only when their immediate energy reserves are depleted.

_____ 7. Evidence suggests that obesity may be associated with reduced dopamine function in the brain.

Psychological Needs as Motivators

KEY THEME

› According to the motivation theories of Maslow and of Deci and Ryan, psychological needs must be fulfilled for optimal human functioning.

KEY QUESTIONS

› How does Maslow's hierarchy of needs explain human motivation?

› What are some important criticisms of Maslow's theory?

› What are the basic premises of self-determination theory?

hierarchy of needs Maslow's hierarchical division of motivation into levels that progress from basic physical needs to psychological needs to self-fulfillment needs.

In studying the idea that we are motivated to satisfy fundamental psychological needs, psychologists have grappled with several key questions:

- Are there universal psychological needs?
- Are we internally or externally motivated to satisfy psychological needs?
- What psychological needs must be satisfied for optimal human functioning?

In this section, we'll first consider two theories that have tried to answer those questions: Abraham Maslow's famous *hierarchy of needs* and the more recently developed *self-determination theory* of Edward L. Deci and Richard M. Ryan.

Maslow's Hierarchy of Needs

A major turning point in the discussion of human needs occurred when humanistic psychologist **Abraham Maslow** developed his model of human motivation in the 1940s and 1950s. Maslow acknowledged the importance of biological needs as motivators. But once basic biological needs are satisfied, he believed, "higher" psychological needs emerge to motivate human behavior.

The centerpiece of Maslow's (1954, 1968) model of motivation was his famous **hierarchy of needs,** summarized in Figure 8.8. Maslow believed that people are motivated to satisfy the needs at each level of the hierarchy before moving up to the next level.



FIGURE 8.8 Maslow's Hierarchy of Needs
Abraham Maslow believed that people are innately motivated to satisfy a progression of needs, beginning with the most basic physiological needs. Once the needs at a particular level are satisfied, the individual is motivated to satisfy the needs at the next level, steadily progressing upward. The ultimate goal is self-actualization, the realization of personal potential.

Source: Based on Maslow (1970).



It is quite true that man lives by bread alone—where there is no bread. But what happens to man's desires when there is plenty of bread and when his belly is chronically filled? At once other (and "higher") needs emerge and these, rather than physiological hungers, dominate the organism. And when these in turn are satisfied, again new (and still "higher") needs emerge, and so on. That is what we mean by saying that the basic human needs are organized into a hierarchy of relative prepotency.

—*Abraham Maslow (1943)*

Courtesy of Brandeis University

As people progressively move up the hierarchy, they are ultimately motivated by the desire to achieve self-actualization. The lowest levels of Maslow's hierarchy emphasize fundamental biological and safety needs. At the higher levels, the needs become more social and psychologically growth-oriented, culminating in the need to achieve *self-actualization*.

What exactly is self-actualization? Maslow (1970) himself had trouble defining the term, saying that self-actualization is "a difficult syndrome to describe accurately." Nonetheless, Maslow defined **self-actualization** in the following way:

> It may be loosely described as the full use and exploitation of talents, capacities, potentialities, etc. Such people seem to be fulfilling themselves and to be doing the best that they are capable of doing. . . . They are people who have developed or are developing to the full stature of which they are capable.

Beyond that general description, Maslow's research identified several characteristics of self-actualized people, which are summarized in Table 8.2.

Maslow's model of motivation generated considerable research, especially during the 1970s and 1980s. Some researchers found support for Maslow's ideas (e.g., Graham & Balloun, 1973). Others, however, criticized his model on several points (e.g., Fox, 1982; Neher, 1991; Wahba & Bridwell, 1976). Maslow's concept of self-actualization is very vague and almost impossible to define in a way that would allow it to be tested scientifically. And Maslow's initial studies on self-actualization were based on limited samples with questionable reliability. For example, Maslow (1970) often relied on the life stories of acquaintances whose identities were never revealed. He also studied the biographies and autobiographies of famous historical figures he believed had achieved self-actualization, such as Eleanor Roosevelt, Abraham Lincoln, and Albert Einstein.

There is a more important criticism. Despite the claim that self-actualization is an inborn motivational goal toward which all people supposedly strive, most people do *not* experience or achieve self-actualization. Maslow (1970) himself wrote that self-actualization "can seem like a miracle, so improbable an event as to be awe-inspiring." Maslow explained this basic contradiction in a number of different ways. For instance, he suggested that few people experience the supportive environment that is required to achieve self-actualization.

In general, Maslow's notion that we must satisfy needs at one level before moving to the next level has not stood up (Sheldon & others, 2001). Perhaps Maslow's most important contribution was to encourage psychology to focus on the motivation and development of psychologically healthy people (King, 2008). In advocating that idea, he helped focus attention on psychological needs as motivators.

TABLE 8.2

Maslow's Characteristics of Self-Actualized People

Realism and acceptance	Self-actualized people have accurate perceptions of themselves, others, and external reality.
Spontaneity	Self-actualized people are spontaneous, natural, and open in their behavior and thoughts. However, they can easily conform to conventional rules and expectations when necessary.
Problem centering	Self-actualized people focus on problems outside themselves. They often dedicate themselves to a larger purpose in life.
Autonomy	Although they accept and enjoy other people, self-actualized individuals have a strong need for privacy and independence.
Continued freshness of appreciation	Self-actualized people continue to appreciate the simple pleasures of life with awe and wonder.
Peak experiences	Self-actualized people commonly have *peak experiences*, or moments of intense ecstasy, wonder, and awe during which their sense of self is lost or transcended.

Source: Based on Maslow (1970).

Deci and Ryan's Self-Determination Theory

University of Rochester psychologists **Edward L. Deci** and **Richard M. Ryan** (2000, 2008a, 2008b) have developed **self-determination theory,** abbreviated **SDT.** Much like Maslow's theory, SDT's premise is that people are actively growth oriented and that they move toward a unified sense of self and integration with others. To realize optimal psychological functioning and growth throughout the lifespan, Ryan and Deci contend that three innate and universal psychological needs must be satisfied:

- *Autonomy*—the need to determine, control, and organize one's own behavior and goals so that they are in harmony with one's own interests and values.
- *Competence*—the need to learn and master appropriately challenging tasks.
- *Relatedness*—the need to feel attached to others and experience a sense of belongingness, security, and intimacy.

Like Maslow, Deci and Ryan view the need for social relationships as a fundamental psychological motive. The benefits of having strong, positive social relationships are well documented (Leary & Allen, 2011). Another well-established psychological need is having a sense of competence or mastery (Bandura, 1997; White, 1959).

One subtle difference in Maslow's views compared to those of Deci and Ryan has to do with the definition of *autonomy.* Deci and Ryan's definition of *autonomy* emphasizes the need to feel that your activities are self-chosen and self-endorsed (Ryan & Deci, 2011; Niemiec & others, 2010). This reflects the importance of self-determination in Deci and Ryan's theory. In contrast, Maslow's view of *autonomy* stressed the need to feel independent and focused on your own potential (see Table 8.2 on page 334).

How does a person satisfy the needs for autonomy, competence, and relatedness? In a supportive social, psychological, and physical environment, an individual will pursue interests, goals, and relationships that tend to satisfy these psychological needs. In turn, this enhances the person's psychological growth and intrinsic motivation (Sheldon & Ryan, 2011). **Intrinsic motivation** is the desire to engage in tasks that the person finds inherently satisfying and enjoyable, novel, or optimally challenging.

Of course, much of our behavior in daily life is driven by extrinsic motivation (Ryan & La Guardia, 2000). **Extrinsic motivation** consists of external influences on behavior, such as rewards, social evaluations, rules, and responsibilities. According to Ryan and Deci, the person who has satisfied the needs for competence, autonomy, and relatedness actively *internalizes* and *integrates* different external motivators as part of his or her identity and values. In effect, the person incorporates societal expectations, rules, and regulations as values or rules that he or she personally endorses.

What if one or more of the psychological needs are thwarted by an unfavorable environment, one that is overly challenging, controlling, rejecting, punishing, or even abusive? According to SDT, the person may compensate with substitute needs, defensive behaviors, or maladaptive behaviors. For example, if someone is frustrated in satisfying the need for relatedness, he or she may compensate by chronically seeking the approval of others or by pursuing substitute goals, such as accumulating money or material possessions.

In support of self-determination theory, Deci and Ryan have compiled an impressive array of studies, including cross-cultural studies (Deci & Ryan, 2000, 2008a, 2008b; Ryan & Deci, 2000, 2001, 2011). Taking the evolutionary perspective, they also argue that the needs for autonomy, competence, and relatedness have adaptive advantages. For example, the need for relatedness promotes resource sharing, mutual protection, and the division of work, increasing the likelihood that both the individual and the group will survive.

self-actualization Defined by Maslow as a person's "full use and exploitation of talents, capacities, and potentialities."

self-determination theory (SDT) Edward Deci and Richard Ryan's theory that optimal human functioning can occur only if the psychological needs for autonomy, competence, and relatedness are satisfied.

intrinsic motivation The desire to engage in tasks that are inherently satisfying and enjoyable, novel, or optimally challenging; the desire to do something for its own sake.

extrinsic motivation External factors or influences on behavior, such as rewards, consequences, or social expectations.



© 2002 The New Yorker Collection from cartoonbank.com. Roz Chast.

competence motivation The desire to direct your behavior toward demonstrating competence and exercising control in a situation.

achievement motivation The desire to direct your behavior toward excelling, succeeding, or outperforming others at some task.

Thematic Apperception Test (TAT) A projective test developed by Henry Murray and his colleagues that involves creating stories about ambiguous scenes that can be interpreted in a variety of ways.

Competence and Achievement Motivation

KEY THEME

› Competence and achievement motivation are important psychological motives.

KEY QUESTIONS

› How does competence motivation differ from achievement motivation, and how is achievement motivation measured?

› What characteristics are associated with a high level of achievement motivation, and how does culture affect achievement motivation?

In self-determination theory, Deci and Ryan identified *competence* as a universal motive. You are displaying **competence motivation** when you strive to use your cognitive, social, and behavioral skills to be capable and exercise control in a situation (White, 1959). Competence motivation provides much of the motivational "push" to prove to yourself that you can successfully tackle new challenges, such as striving to do well in this class.

A step beyond competence motivation is **achievement motivation**—the drive to excel, succeed, or outperform others at some task. Creaming your rival in a competitive game and trying to outdo your own previous level of performance, as did our running friend Randy in the chapter prologue, are examples of achievement motivation. So is getting an A+ on a difficult exam or becoming the top-selling salesperson in your region.

In the 1930s, Henry Murray identified 20 fundamental human needs or motives, including achievement motivation. Murray (1938) defined the "need to achieve" as the tendency "to overcome obstacles, to exercise power, [and] to strive to do something difficult as well and as quickly as possible." Also in the 1930s, Christiana Morgan and Henry Murray (1935) developed a test to measure human motives called the **Thematic Apperception Test (TAT).** The TAT consists of a series of ambiguous pictures. The person being tested is asked to make up a story about each picture, and the story is then coded for different motivational themes, including achievement. In Chapter 11, on personality, we'll look at the TAT in more detail.

In the 1950s, David McClelland, John Atkinson, and their colleagues (1953) developed a specific TAT scoring system to measure the *need for achievement,* often abbreviated *nAch.* Other researchers developed questionnaire measures of achievement motivation (Spangler, 1992; Ziegler & others, 2010).

Over the next four decades, McClelland and his associates investigated many different aspects of achievement motivation, especially its application in work settings. In cross-cultural studies, McClelland explored how differences in achievement motivation at the national level have influenced economic development (McClelland, 1961, 1976; McClelland & Winter, 1971). He also studied organizational leadership and *power motivation*—the urge to control or influence the behavior of other people or groups (McClelland, 1975, 1989).

Hundreds of studies have shown that measures of achievement motivation generally correlate well with various areas of success, such as school grades, job performance, and worker output (Senko & others, 2008). This is understandable, since people who score high in achievement motivation expend their greatest efforts when faced with moderately challenging tasks. In striving to achieve the task, they often choose to work long hours and have the capacity to delay gratification and focus on the goal. They also tend to display original thinking, seek expert advice, and value feedback about their performance (McClelland, 1985b).

Although people high in achievement motivation prefer to work independently, the most successful people also have the ability to work well with others (McClelland, 1985a, 1987). And in assessing their own performance, high achievers tend to attribute their successes to their own abilities and efforts, and to explain their failures as being due to external factors or bad luck (Weiner, 1985).

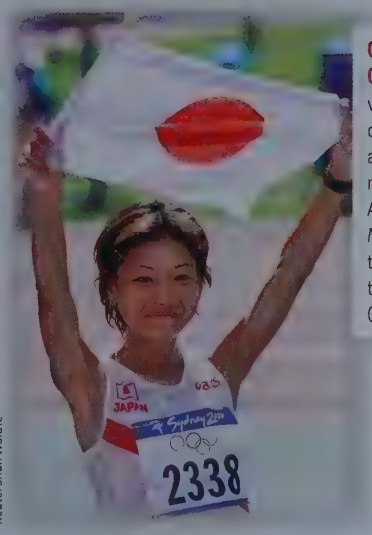
Extraordinary Achievement Motivation More than 10,000 students from 91 countries competed in the inaugural Google Science Fair, billed as the largest and first-ever global science fair. The winners: Grand Prize Winner Shree Bose (center), who studied the development of drug resistance in ovarian cancer cells; Lauren Hodge (left), who discovered that lemon juice (but not olive oil) can inhibit the formation of carcinogenic compounds in barbecued chicken; and Naomi Shah (right) who examined the links between asthma and indoor air quality.



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Achievement Motivation and Culture

When it is broadly defined as "the desire for excellence," achievement motivation is found in many, if not all, cultures. In individualistic cultures, like those that characterize North American and European countries, the need to achieve emphasizes personal, individual success rather than the success of the group. In these cultures, achievement motivation is also closely linked with succeeding in competitive tasks (Markus & others, 2006; Morling & Kitayama, 2008).



Reuters/Ian Waldie

Celebrating Achievement in a Collectivistic Culture When Japanese marathoner Naoko Takahashi won an Olympic gold medal, she credited "the best coach in the world, the best manager in the world, and all the people who supported me. I didn't [win] it alone, not by myself." Comparing statements by Japanese and American athletes during the Olympics, Hazel Rose Markus found that Japanese emphasized the importance of their supportive relationships, but Americans tended to see their wins as an individual achievement (Markus & others, 2006).

In collectivistic cultures, like those of many Asian countries, achievement motivation tends to have a different focus. Instead of being oriented toward the individual, achievement orientation is more *socially* oriented (Bond, 1986; Kitayama & Park, 2007). For example, students in China felt that it was unacceptable to express pride for personal achievements but that it was acceptable to feel proud of achievements that benefited others (Stipek, 1998). The person strives to achieve not to promote himself or herself but to promote the status or well-being of other members of the relevant social group, such as family members (Matsumoto & Juang, 2008).

Individuals in collectivistic cultures may persevere or aspire to do well in order to fulfill the expectations of family members and to fit into the larger group. For example, the Japanese student who strives to do well academically is typically not motivated by the desire for personal recognition. Rather, the student's behavior is more likely to be motivated by the desire to enhance the social standing of his or her family by gaining admission to a top university (Kitayama & Park, 2007).

CONCEPT REVIEW 8.2

Psychological Needs as Motivators

Circle the letter of the correct answer.

1. Compared to those in individualistic cultures, people in collectivistic cultures:
   a. are much less likely to achieve self-actualization.
   b. are more likely to value extrinsic motivation over intrinsic motivation.
   c. are more likely to be motivated to pursue achievements to promote the social status of their family or social group.
   d. place much less value on the importance of self-esteem in psychological well-being.

2. Who said, "[It] can seem like a miracle, so improbable an event as to be awe-inspiring," and what is he or she describing?
   a. Edward Deci, describing *intrinsic motivation*.
   b. Abraham Maslow, describing *self-actualization*.
   c. Henry Murray, describing the development of the *Thematic Apperception Test*.
   d. Julia Roberts, describing how difficult it is to achieve stardom in Hollywood.

3. Deci and Ryan's self-determination theory:
   a. accurately describes psychological motives in individualistic but not collectivistic cultures.
   b. has shown that self-actualization can be achieved even if only one of the innate psychological needs has been satisfied.
   c. challenged the evolutionary perspective's notion that the need for relatedness has adaptive advantages.
   d. contends that psychologically healthy people internalize external motivators as part of their identity and values.

4. People who rate high on achievement motivation:
   a. have the capacity to delay gratification in working hard to achieve goals.
   b. explain their failures as being due to a lack of effort or abilities.
   c. are no more likely to achieve challenging goals than are people who rate low on achievement motivation.
   d. avoid competing with others.

Emotion

KEY THEME

› Emotions are complex psychological states that serve many functions in human behavior and relationships.

KEY QUESTIONS

› What are the three components of emotion, and what functions do emotions serve?

› How do evolutionary psychologists view emotion?

› What are the basic emotions?

With a final score of 25 to 23, our daughter Laura's freshman high school basketball team had just won its first game of the season. After lining up for the ceremonial "high fives" with the defeated team, Laura's team erupted in shouts of joy, leaping into the air, hugging, and slapping more high fives. In contrast, the girls on the defeated team maintained polite but resigned smiles. One seemed to fight back tears. Another was downright angry. The girls, their coaches, and many of the spectators were clearly having an emotional experience—one that is familiar to everyone. But what, exactly, is emotion?



Blend Images/Jupiterimages

The Many Functions of Emotion
Emotions play an important role in relationships and social communication. If a friend tells you that she is thrilled, happy, or excited, you immediately understand her internal emotional state.

Emotion is a complex psychological state that involves three distinct components: a *subjective experience,* a *physiological response,* and a *behavioral* or *expressive response.* How are emotions different from moods? Generally, emotions are intense but rather short-lived. Emotions are also more likely to have a specific cause, to be directed toward some particular object, and to motivate a person to take some sort of action. In contrast, a *mood* involves a milder emotional state that is more general and pervasive, such as gloominess or contentment. Moods may last for a few hours or even days (Gendolla, 2000).

The Functions of Emotion

Emotional processes are closely tied to motivational processes. Like the word *motivation,* the root of the word *emotion* is the Latin word *movere,* which means "to move." And indeed, emotions can move us to act, triggering motivated behavior. In the prologue, Randy's unhappiness and dissatisfaction motivated him to end his relationship with Sara. Similarly, anger might motivate you to seek another job when you feel you've been treated unfairly.

Emotions help us to set goals, but emotional states can also be goals in themselves. We ride a roller coaster to achieve emotional excitement or practice every day to relish the satisfaction of eventually winning a piano competition. And most of us direct our lives so as to maximize the experience of positive emotions and minimize the experience of negative emotions (Gendolla, 2000).

At one time, psychologists considered emotions to be disruptive forces that interfered with rational behavior (Cacioppo & Gardner, 1999). Emotions were thought of as primitive impulses that needed to be suppressed or controlled.

Today, psychologists are much more attuned to the importance of emotions in many different areas of behavior, *including* rational decision making, purposeful behavior, and setting appropriate goals (Loewenstein & others, 2001; Mikels & others, 2011). Most of our choices are guided by our feelings, sometimes without our awareness (Kouider & others, 2011). But consider the fate of people who have lost the capacity to feel emotion because of damage to specific brain areas. Despite having an intact ability to reason, such people tend to make disastrous decisions (Damasio, 2004; Rilling & Sanfey, 2011).

Similarly, people who are low in what is termed **emotional intelligence** may have superior reasoning powers, but they sometimes experience one failure in life after another (Mayer & others, 2004; Van Heck & den Oudsten, 2008). Why? Because they

emotion A complex psychological state that involves a subjective experience, a physiological response, and a behavioral or expressive response.

emotional intelligence The capacity to understand and manage your own emotional experiences and to perceive, comprehend, and respond appropriately to the emotional responses of others.

basic emotions The most fundamental set of emotion categories, which are biologically innate, evolutionarily determined, and culturally universal.

lack the ability to manage their own emotions, comprehend the emotional responses of others, and respond appropriately to the emotions of other people. In contrast, people who are high in emotional intelligence possess these abilities, and they are able to understand and use their emotions (Mayer & others, 2008; Telle & others, 2011).

Evolutionary Explanations of Emotion

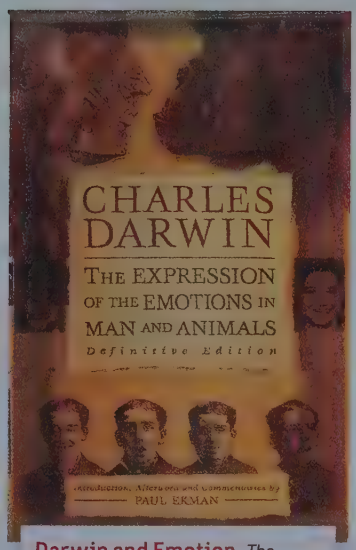
One of the earliest scientists to systematically study emotions was **Charles Darwin.** Darwin published *The Expression of the Emotions in Man and Animals* in 1872, 13 years after he had laid out his general theory of evolution in *On the Origin of Species by Means of Natural Selection* and only a year after his book on the evolution of humans, *The Descent of Man* (1871). Darwin (1872) described the facial expressions, body movements, and postures used to express specific emotions in animals and humans. He argued that emotions reflect evolutionary adaptations to the problems of survival and reproduction.

Like Darwin, today's evolutionary psychologists believe that emotions are the product of evolution (Ermer & others, 2007; Tooby & Cosmides, 2005). Emotions help us solve adaptive problems posed by our environment. They "move" us toward potential resources, and they move us away from potential dangers. Fear prompts us to flee an attacker or evade a threat. Anger moves us to turn and fight a rival. Love propels us to seek out a mate and care for our offspring. Disgust prompts us to avoid a sickening stimulus. Obviously, the capacity to feel and be moved by emotion has adaptive value: An organism that is able to quickly respond to rewards or threats is more likely to survive and successfully reproduce.

Darwin (1872) also pointed out that emotional displays serve the important function of informing other organisms about an individual's internal state. When facing an aggressive rival, the snarl of a baboon signals its readiness to fight. A wolf rolling submissively on its back telegraphs its willingness to back down and avoid a fight.

Emotions are also important in situations that go well beyond physical survival. Virtually all human relationships are heavily influenced by emotions. Our emotional experience and expression, as well as our ability to understand the emotions of others, are crucial to the maintenance of social relationships (Reis & others, 2000).

In the next several sections, we'll consider each of the components of emotion in turn, beginning with the component that is most familiar: the subjective experience of emotion.



Charles Darwin, *The Expression of the Emotions in Man and Animals*, Definitive Edition. Paul Ekman (Ed.). New York: Oxford University Press, 1998.

Darwin and Emotion *The Expression of the Emotions in Man and Animals* was a best-seller when it was first published in 1872. It was also the first scientific book to take advantage of the new technology of photography. Charles Darwin was one of the first scientists to systematically study emotional expressions. He hoped to show the continuity of emotional expressions among nonhuman animals and humans—additional evidence for his evolutionary theory.

The Subjective Experience of Emotion

Most emotion researchers today agree that there are a limited number of **basic emotions** that all humans, in every culture, experience. These basic emotions are thought to be biologically determined, the products of evolution. And what are these basic emotions? As shown in Table 8.3, fear, disgust, surprise, happiness, anger, and sadness are most commonly cited as the basic emotions (Ekman, 1992a; Matsumoto & Hwang, 2011a).

Many psychologists contend that each basic emotion represents a sequence of responses that is innate and hard-wired in the brain (Tooby & Cosmides, 2000; Vytal & Hamann, 2010). But your emotional experience is not limited to pure forms of each basic emotion. Rather, each basic emotion represents a family of related emotional states (Ekman, 1994a, 1994b). For example, consider the many types of angry feelings, which can range from mild annoyance to bitter resentment or fierce rage.

Further, psychologists recognize that emotional experience can be complex and multifaceted (Larsen & McGraw, 2011). People often experience a *blend* of emotions. As he was milling around with the other 10,000 runners waiting for the starting gun of the Tulsa Run, Randy simultaneously felt excited and anxious.

In more complex situations, people may experience *mixed emotions*, in which very different emotions are experienced simultaneously or in rapid succession (Larsen & McGraw, 2011). As he talked about the ending of his relationship with Sara, for example, Randy expressed anger, sadness, regret, and relief.

TABLE 8.3

The Basic Emotions

Fear	Disgust
Surprise	Happiness
Anger	Sadness

Although there is some disagreement as to exactly which emotions best represent the universal set of basic emotions, most emotion researchers today agree on the six emotions shown above. Other possible candidates are contempt or disdain, pride, and excitement.



Socially Engaged Emotions in Japan
Closeness and interdependence are fostered by Japanese child-rearing practices, and some psychologists believe they also form the basis for such other-focused emotions as *amae*, a central emotion in Japanese culture (Markus & Kitayama, 1991). *Amae* can be defined as the sense of being lovingly cared for and unconditionally accepted by another person. *Amae* can be achieved only within a reciprocal, interdependent relationship with someone else. Thus, *amae* is a prototypical example of a socially engaged emotion—an other-focused emotion that creates and fosters interdependence with significant others (Rothbaum & others, 2007; Yamaguchi & Ariizumi, 2006).

amana images inc./Alamy

Culture, Gender, and Emotional Experience

In diverse cultures, psychologists have found general agreement regarding the subjective experience and meaning of different basic emotions (Scherer & Wallbott, 1994). Canadian psychologist James Russell (1991) compared emotion descriptions by people from several different cultures. He found that emotions were most commonly classified according to two dimensions: (1) the degree to which the emotion is *pleasant* or *unpleasant* and (2) the level of *activation,* or arousal, associated with the emotion. For example, joy and contentment are both pleasant emotions, but joy is associated with a higher degree of activation (Feldman Barrett & Russell, 1999).

While these may be the most fundamental dimensions of emotion, cultural variations in classifying emotions do exist (White, 1994). For example, Hazel Rose Markus and Shinobu Kitayama (1991, 1994) found that Japanese subjects classified emotions in terms of not two but three important dimensions. Along with the pleasantness and activation dimensions, they also categorized emotions along a dimension of **interpersonal engagement.** This dimension reflects the idea that some emotions result from your connections and interactions with other people (Kitayama & others, 2000). Japanese participants rated anger and shame as being about the same in terms of unpleasantness and activation, but they rated shame as being much higher than anger on the dimension of interpersonal engagement.

Why would the Japanese emphasize interpersonal engagement as a dimension of emotion? Japan is a collectivistic culture, so a person's identity is seen as interdependent with those of other people, rather than independent, as is characteristic of the more individualistic cultures. Thus, social context is an important part of private emotional experience (Kitayama & Park, 2007).

What about gender differences in emotional experience? Both men and women tend to believe that women are "more emotional" than men (Barrett & Bliss-Moreau, 2009; Vigil, 2009). However, many studies have shown that men and women don't really differ in either frequency or intensity of emotional experience (see Kring & Gordon, 1998; Thunberg & Dimberg, 2000).

Rather, the sexes do differ in the expression of emotions. In a nutshell, women tend to be more emotionally expressive (Langer, 2010). Women tend to be much more at ease expressing their emotions, thinking about emotions, and recalling emotional experiences (Feldman Barrett & others, 2000). We discuss gender differences in emotion in more detail in Chapter 10.

The Neuroscience of Emotion

KEY THEME

› Emotions are associated with distinct patterns of responses by the sympathetic nervous system and in the brain.

KEY QUESTIONS

› How is the sympathetic nervous system involved in intense emotional responses?

› What brain structures are involved in emotional experience, and what neural pathways make up the brain's fear circuit?

› How does the evolutionary perspective explain the dual brain pathways for transmitting fear-related information?

interpersonal engagement Emotion dimension reflecting the degree to which emotions involve a relationship with another person or other people.

Psychologists have long studied the physiological aspects of emotion. Early research focused on the autonomic nervous system's role in triggering physiological arousal. More recently, brain-imaging techniques have identified specific brain regions involved in emotions. In this section, we'll look at both areas of research.

Emotion and the Sympathetic Nervous System

Hot Heads and Cold Feet

The pounding heart, rapid breathing, trembling hands and feet, and churning stomach that occur when you experience an intense emotion like fear reflect the activation of the sympathetic branch of the *autonomic nervous system*. When you are threatened, the *sympathetic nervous system* triggers the *fight-or-flight response,* a rapidly occurring series of automatic physical reactions. Breathing and heart rate accelerate, and blood pressure surges. You perspire, your mouth goes dry, and the hairs on your skin may stand up, giving you the familiar sensation of goose bumps. Your pupils dilate, allowing you to take in a wider visual field. Blood sugar levels increase, providing a burst of energy. Digestion stops as blood is diverted from the stomach and intestines to the brain and skeletal muscles, sometimes causing the sensations of light-headedness or "butterflies" fluttering in your stomach. The polygraph or "lie detector" measures these physiological reactions associated with emotional arousal (see the In Focus box, "Detecting Lies").

IN FOCUS

Detecting Lies

The *polygraph,* commonly called a *lie detector,* doesn't really detect lies or deception. Rather, a polygraph measures physiological changes associated with emotions like fear, tension, and anxiety. Heart rate, blood pressure, respiration, and other indicators are monitored during a polygraph interview. The polygraph is based on the assumption that lying is accompanied by anxiety, fear, and stress. When people show arousal patterns typically associated with anxiety or fear, lying is inferred (Grubin, 2010; Meijer & Verschuere, 2010).

There are many potential problems with using a polygraph to detect lying. First, there is no unique pattern of physiological arousal associated specifically with lying (Vrij & others, 2010). Second, some people can lie without experiencing anxiety or arousal. This produces a false negative result—the liar is judged to be telling the truth. Third, people may be innocent of any wrongdoing but still be fearful or anxious when asked incriminating questions—especially if they believe that they are suspected of a crime. Truth-tellers can be as nervous as liars, especially if they have reason to believe that negative consequences will follow if they are disbelieved (Vrij & others, 2010). This can lead to false positive results—innocent people are judged as being guilty. In fact, polygraph tests are more likely to wrongly identify innocent people as guilty than guilty people as innocent (Bashore & Rapp, 1993; National Research Council, 2003).

Finally, interpreting polygraph results can be highly subjective. In one study, polygraph results were compared to later confessions of guilt in criminal cases. Lying was accurately detected by the polygraph examiners at a rate just slightly better than flipping a coin (Phillips, 1999).

In the scientific community, it is generally agreed that polygraphs are not a valid method to detect lies and that their results should not be used as evidence (National Research Council, 2003). Because of the polygraph's high error rate, many states do not allow polygraph tests as evidence in court. However, the U.S. government uses polygraph testing in several agencies, including the CIA and the Department of Energy (Holden, 2001).



Greg Gayne/© Fox/Courtesy: Everett Collection

Catching Liars Actor Tim Roth played psychologist and professional lie detector Dr. Cal Lightman in the critically acclaimed TV series "Lie to Me," a drama loosely based on the scientific work of emotion researcher Paul Ekman, who served as a scientific consultant on the program. Like Ekman, the fictional Lightman is an expert on reading microexpressions, although he also uses other lie detection methods. However, Lightman's highly unconventional—and often unethical—methods have little in common with Ekman's scientific research. "Dr. Lightman, in less than 45 minutes, accomplishes things that take me weeks, if not months, to figure out," Ekman (2009) commented. "But I suppose if they really showed what I do, people would change the channel because it would be too slow."

Microexpressions: Fleeting Indicators of Deceit

Emotion researcher Paul Ekman (2003) has found that deception is associated with a variety of nonverbal cues, such as fleeting facial expressions, vocal cues, and nervous body movements. Especially revealing are the fleeting facial expressions, called *microexpressions*, that last about 1/25 of a second. When people lie and try to control their facial expressions, microexpressions of fear, guilt, or anxiety often "leak" through (Ekman & O'Sullivan, 2006). Even so, no single nonverbal cue indicates that someone is lying. However, people who are skilled at decoding nonverbal cues—like clinical psychologists—are better than other people at detecting deception (Bond, 2008; Ekman & others, 1999).



Arousal and Intense Emotion: Tears of Joy This Indonesian woman sheds tears of joy at her soldier husband's safe return from a distant war zone. Many intense emotions involve the activation of the sympathetic nervous system. Although emotions like extreme joy, fear, and grief subjectively feel very different, they all involve increases in heart rate, breathing, and blood pressure. From an evolutionary perspective, the physical arousal associated with intense emotion helps gear people up to take action.

Crack Palinggi/Reuters/Corbis

The sympathetic nervous system is also activated by other intense emotions, such as excitement, passionate love, or extreme joy. If you've ever ridden an exciting roller coaster, self-consciously given a speech in front of your peers, or been reunited with a loved one after a long absence, you've experienced the high levels of physiological arousal that can be produced by other types of emotions. Obviously, not all emotions involve intense physical reactions. And some emotions, such as contentment, are characterized by decreased physical arousal and the slowing of some body processes (Levenson & others, 1990, 1992).

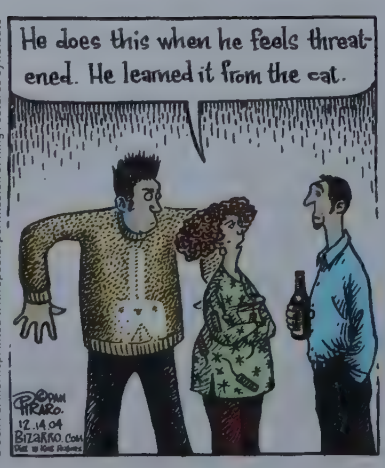
Research has shown that there are differing patterns of physiological arousal for different emotions (Ekman, 2003). In one series of studies, psychologist Robert W. Levenson (1992) found that fear, anger, and sadness are all associated with accelerated heart rate. But comparing anger and fear showed differences that confirm everyday experience. Anger produces greater increases in blood pressure than fear. And while anger produces an increase in skin temperature, fear produces a *decrease* in skin temperature. Perhaps that's why when we are angry, we speak of "getting hot under the collar," and when fearful, we feel clammy and complain of having "cold feet."

Levenson (1992, 2003) believes that these differing patterns of sympathetic nervous system activation are universal, reflecting biological responses to the basic emotions that are hard-wired by evolution into all humans. Supporting this contention, Levenson found that male and female subjects, as well as young and elderly subjects, experience the *same* patterns of autonomic nervous system activity for different basic emotions. These distinctive patterns of emotional physiological arousal were also found in members of a remote culture in western Sumatra, an island in Indonesia (Levenson & others, 1992). Broader surveys of different cultures have also demonstrated that the basic emotions are associated with distinct patterns of autonomic nervous system activity (Levenson, 2003; Scherer & Wallbott, 1994).

The Emotional Brain

Fear and the Amygdala

Sophisticated brain-imaging techniques have led to an explosion of new knowledge about the brain's role in emotion. Of all the emotions, the brain processes involved in *fear* have been most thoroughly studied. Many brain areas are implicated in emotional responses, but the brain structure called the **amygdala** has long been known to be especially important. As described in Chapter 2, the amygdala is an almond-shaped cluster of neurons located deep in the temporal lobe on each side of the brain. The amygdala is part of the *limbic system,* a group of brain structures involved in emotion, memory, and basic motivational drives, such as hunger, thirst, and sex. Neural pathways connect the amygdala with many other brain structures (Pessoa & Adolphs, 2010).



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Several studies have shown that the amygdala is a key brain structure in the emotional response of fear in humans (Davis & Whalen, 2001). For example, brain-imaging techniques have demonstrated that the amygdala activates when you view threatening or fearful faces, or hear people make nonverbal sounds expressing fear (Morris & others, 1999; Öhman & others, 2007). Even when people simply anticipate a threatening stimulus, the amygdala activates as part of the fear circuit in the brain (Phelps & others, 2001).

In rats, amygdala damage disrupts the neural circuits involved in the fear response. For example, rats with a damaged amygdala can't be classically conditioned to acquire a fear response (LeDoux, 2007). In humans, damage to the amygdala also disrupts elements of the fear response. For example, people with amygdala damage lose the ability to distinguish between friendly and threatening faces (Adolphs & others, 1998).

Activating the Amygdala: Direct and Indirect Neural Pathways Let's use an example to show how the amygdala participates in the brain's fear circuit. Imagine that your sister's eight-year-old son sneaks up behind you at a family picnic and pokes

FOCUS ON NEUROSCIENCE

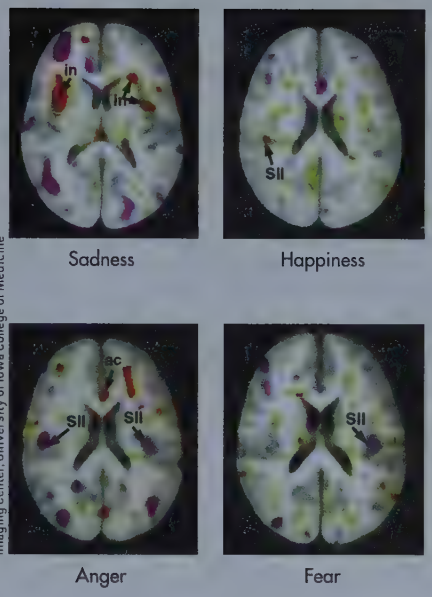
Emotions and the Brain

Do Different Emotions Activate Different Brain Areas?

The idea that different combinations of brain regions are activated by different emotions received considerable support in a brain-imaging study by neuroscientist Antonio Damasio and his colleagues (2000). In the study, participants were scanned using positron emission tomography (PET) while they recalled emotionally charged memories to generate feelings of sadness, happiness, anger, and fear.

Each of the four PET scans shown here is an averaged composite of all 39 participants in the study. Significant areas of brain activation are indicated in red, while significant areas of deactivation are indicated in purple. Notice that sadness, happiness, anger, and fear each produced a distinct pattern of brain activation and deactivation. These findings confirmed the idea that each emotion involves distinct neural circuits in the brain. Other research has produced similar findings (Dalgleish, 2004; Vytal & Hamann, 2010).

One interesting finding in the Damasio study was that the emotional memory triggered autonomic nervous system activity and physiological arousal *before* the volunteers signaled that they were subjectively "feeling" the target emotion. Areas of the somatosensory cortex, which processes sensory information from the skin, muscles, and internal organs, were also activated. These sensory signals from the body's peripheral nervous system contributed to the overall subjective "feeling" of a particular emotion. Remember Damasio's findings because we'll refer to this study again when we discuss theories of emotion.



Courtesy of Antonio R. Damasio, Department of Neurology and PET Imaging Center, University of Iowa College of Medicine

you in the back with a long stick. As you quickly wheel around, he shouts, "Look what I found in the woods!" Dangling from the stick is a wriggling, slimy-looking, three-foot-long snake. He tosses the snake into your face, and you let out a yell and jump two feet into the air. As he bursts into hysterical laughter, you quickly realize that the real-looking snake is made of rubber, your nephew is a twit, and your sister is laughing as hard as her son.

Even if you don't know any obnoxious eight-year-old boys, you've probably experienced a sudden fright where you instantly reacted to a threatening stimulus, like a snake, a spider, or an oncoming car. Typically, you respond instinctively, without taking time to consciously or deliberately evaluate the situation.

So how can we respond to potentially dangerous stimuli before we've had time to think about them? Let's stay with our example. When you saw the dangling snake, the visual stimulus was first routed to the *thalamus* (see Figure 8.9 on the next page). As we explained in Chapter 2, all incoming sensory information, with the exception of olfactory sensations, is processed in the thalamus before being relayed to sensory centers in the cerebral cortex.

However, the neuroscientist Joseph LeDoux (1996, 2000) discovered that there are *two* neural pathways for sensory information that project from the thalamus. One leads to the cortex, as previously described, but the other leads directly to the amygdala, bypassing the cortex. When we are faced with a potential threat, sensory information about the threatening stimulus is routed simultaneously along both pathways.

LeDoux (1996) describes the direct thalamus→amygdala pathway as a "shortcut" from the thalamus to the amygdala. This is a "quick-and-dirty" route that transmits crude, almost archetypal, information about the stimulus directly to the amygdala. This rapid transmission allows the brain to start to respond to the possible danger represented by a writhing, curved snake dangling from a stick *before* you have time to consciously think about the stimulus. The amygdala activates and triggers the brain's alarm system.

amygdala (uh-MIG-dull-uh) Almond-shaped cluster of neurons in the brain's temporal lobe, involved in memory and emotional responses, especially fear.

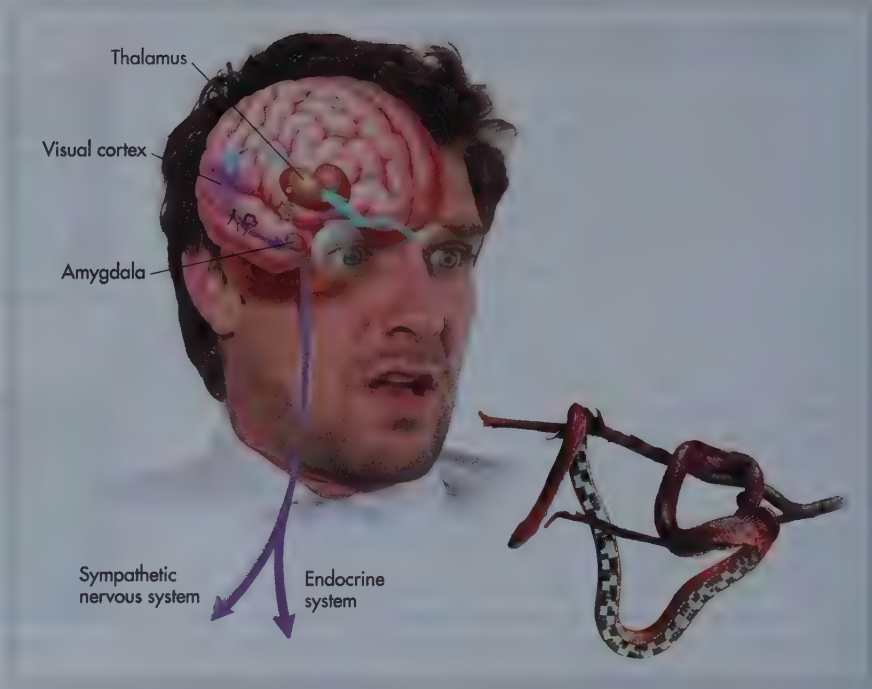


FIGURE 8.9 Fear Circuits in the Brain When you're faced with a potentially threatening stimulus—like a snake dangling from a stick—information arrives in the thalamus and is relayed simultaneously along two pathways. Crude, archetypal information rapidly travels the direct route to the amygdala, triggering an almost instantaneous fear response. More detailed information is sent along the pathway to the visual cortex, where the stimulus is interpreted. If the cortex determines that a threat exists, the information is relayed to the amygdala along the longer, slower pathway. The amygdala triggers other brain structures, such as the hypothalamus, which activate the sympathetic nervous system and the endocrine system's release of stress hormones.

Source: Adapted from LeDoux (1994a, b).

What happens next? The amygdala sends information along neural pathways that project to other brain regions that make up the rest of the brain's fear circuit. One pathway leads to an area of the *hypothalamus,* then on to the *medulla* at the base of the brain. In combination, the hypothalamus and medulla trigger arousal of the sympathetic nervous system. Another pathway projects from the amygdala to a different hypothalamus area that, in concert with the *pituitary gland,* triggers the release of stress hormones (LeDoux, 1995, 2000).

The result? You respond instantly to the threat—"SNAKE!"—by leaping backward, heartbeat and breathing accelerating. But even as you respond to the threat, information is speeding along the other neural pathway that reaches the amygdala by traveling through the cortex. The thalamus sends information to the visual cortex, which creates a detailed and more accurate representation of the visual stimulus. You can also reevaluate the signal that prompted the initial instinctive response. Now you realize that the "snake" is actually just a rubber toy. The cortex sends the "false alarm" message to the amygdala. But note that information traveling the thalamus→cortex→amygdala route takes about twice as long to reach the amygdala as the information traveling along the direct thalamus→amygdala route. Thus, the alarm reaction is already in full swing before signals from the cortex reach the amygdala.

LeDoux believes these dual alarm pathways serve several adaptive functions. The direct thalamus→amygdala pathway rapidly triggers an emotional response to threats that, through evolution, we are biologically prepared to fear, such as snakes, snarling animals, or rapidly moving, looming objects. In contrast, the indirect pathway allows more complex stimuli to be evaluated in the cortex before triggering the amygdala's alarm system. So, for example, the gradually dawning awareness that your job is in jeopardy as your boss starts talking about the need to reduce staff in your department probably has to travel the thalamus→cortex→amygdala pathway before you begin to feel the cold sweat break out on your palms.

In situations of potential danger, it is clearly advantageous to be able to respond quickly. According to LeDoux (1995, 2000), the direct thalamus→amygdala connection represents an adaptive response that has been hard-wired by evolution into the human brain. From the point of view of survival, as LeDoux (1996) remarks, "The time saved by the amygdala in acting on the thalamic interpretation, rather than waiting for the cortical input, may be the difference between life and death."

In support of this evolutionary explanation, Swedish psychologist Arne Öhman and his colleagues (2001b; Schupp & others, 2004) have found that people detect and react more quickly to angry or threatening faces than they do to friendly or neutral faces. Presumably, this reflects the faster processing of threatening stimuli via the direct thalamus→amygdala route (Lundqvist & Öhman, 2005).

The Expression of Emotion

Making Faces

KEY THEME

› The behavioral components of emotion include facial expressions and nonverbal behavior.

KEY QUESTIONS

› What evidence supports the idea that facial expressions for basic emotions are universal?

› How does culture affect the behavioral expression of emotion?

› How can emotional expression be explained in terms of evolutionary theory?

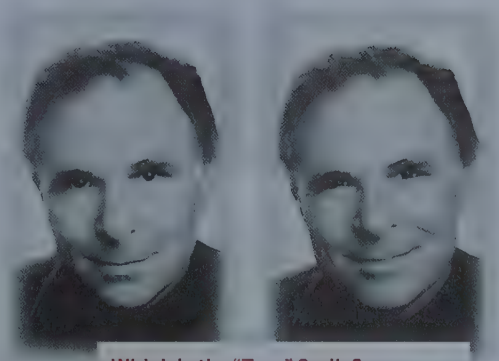
Every day, we witness the behavioral components of emotions in ourselves and others. We laugh with pleasure, slam a door in frustration, or frown at a clueless remark. But of all the ways that we express and communicate our emotional responses, facial expressions are the most important.

In *The Expression of the Emotions in Man and Animals,* Darwin (1872) argued that human emotional expressions are innate and culturally universal. He also noted the continuity of emotional expression between humans and many other species, citing it as evidence of the common evolutionary ancestry of humans and other animals. But do nonhuman animals actually experience emotions? We explore this question in the Critical Thinking box, "Emotion in Nonhuman Animals: Laughing Rats, Silly Elephants, and Smiling Dolphins?" on the next page.

Of course, humans are the animals that exhibit the greatest range of facial expressions. Psychologist **Paul Ekman** has studied the facial expression of emotions for more than four decades. Ekman (1980) estimates that the human face is capable of creating more than *7,000* different expressions. This enormous flexibility allows us considerable versatility in expressing emotion in all its subtle variations.

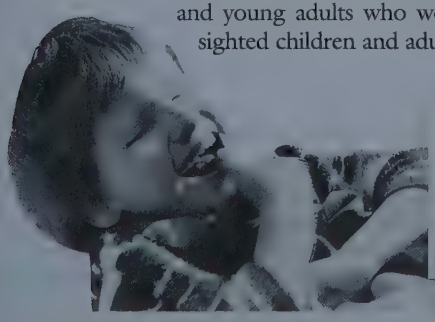
To study facial expressions, Ekman and his colleague Wallace Friesen (1978) coded different facial expressions by painstakingly analyzing the facial muscles involved in producing each expression. In doing so, they precisely classified the facial expressions that characterize the basic emotions of happiness, sadness, surprise, fear, anger, and disgust. When shown photographs of these facial expressions, research participants were able to correctly identify the emotion being displayed (Ekman, 1982, 1992b, 1993).

Ekman concluded that facial expressions for the basic emotions are innate and probably hard-wired in the brain. Further evidence comes from children who are born blind and deaf. Despite their inability to observe or hear others, they express joy, anger, and pleasure using the same expressions as sighted and hearing children (Goodenough, 1932; Matsumoto & Hwang, 2011). Similarly, the spontaneous facial expressions of children and young adults who were born blind do not differ from those of sighted children and adults (Galati & others, 1997, 2003).



Which Is the "True" Smile? Psychologist and emotion researcher Paul Ekman demonstrates the difference between a fake smile *(left)* and the true smile *(right).* If you were able to pick out the true smile, it was because you, like most people, are able to decipher the subtle differences in the facial muscles, especially around the eyes and lips.

Louis Schakel/Michael Kausman/The New York Times Pictures



Facial Expressions Are Innate Born deaf and blind, this 7-year-old girl has never observed the facial expressions of those around her. Yet her smile and laughter are unmistakable and identical to those of other children. Facial expressions, especially for basic emotions, seem to be innate rather than learned (Galati & others, 2003).

From Eibl-Eibesfeldt, I. (1970). Ethology: The Biology of Behavior. New York: Holt. Photo courtesy of I. Eibl-Eibesfeldt

CRITICAL THINKING

Emotion in Nonhuman Animals: Laughing Rats, Silly Elephants, and Smiling Dolphins?

Do animals experience emotions? If you've ever frolicked with a playful puppy or shared the contagious contentment of a cat purring in your lap, the answer seems obvious. But before you accept that answer, remember that emotion involves three components: physiological arousal, behavioral expression, and subjective experience. In many animals, fear and other "emotional" responses appear to involve physiological and brain processes that are similar to those involved in human emotional experience. In mammals, it's also easy to observe behavioral responses when an animal is menaced by a predator or the anger in aggressive displays. But what about subjective experience?



Alan & Sandy Carey

Foxes in Love? Rather than living in a pack like coyotes or wolves, their evolutionary relatives, red foxes form a monogamous pair bond and often mate for life. They live, play, and hunt together and share in the care of their offspring. It's tempting, but unscientific, to label their bond as "love."

Darwin on Animal Emotions

Charles Darwin never doubted that animals experienced emotions. In his landmark work *The Expression of the Emotions in Man and Animals*, Darwin (1872) contended that differences in emotional experience between nonhuman animals and humans are a matter of degree, not kind. "The lower animals, like man, manifestly feel pleasure and pain, happiness and misery," he wrote in *The Descent of Man* in 1871. From Darwin's perspective, the capacity to experience emotion is yet another evolved trait that humans share with lower animals (Bekoff, 2007).



Laughing Rats? Rats are sociable, playful creatures. They emit distinct, high-pitched chirps when they play, anticipate treats, and during positive social interactions. They also chirp when they're tickled by researchers like neuroscientist Jaak Panksepp (2000, 2007a). But when infant rats are separated from their mothers, or when they're cold, they emit a distress cry that is much lower in frequency than the ultrasonic chirps that are associated with pleasant experiences.

Life on white/Alamy

Not all psychologists agree with that stance. Staunch behaviorists like Mark Blumberg and his colleagues (2000) argue that there is no need to assume that the behaviors of animals have an emotional or mental component. For example, they contend that the distress cry of infant rats is *not* the expression of an emotional state. Rather, the cries are an "acoustic by-product" of a physiological process, more like a cough or a sneeze than a human cry (Blumberg & Sokoloff, 2001).

One problem in establishing whether animals experience emotion is the difficulty of determining the nature of an animal's subjective experience. Even Darwin (1871) readily acknowledged this problem, writing, "Who can say what cows feel, when they surround and stare intently on a dying or dead companion?"

Culture and Emotional Expression

Facial expressions for the basic emotions seem to be universal across different cultures (Waller & others, 2008). Ekman (1982) and other researchers showed photographs of facial expressions to people in 21 different countries. Despite their different cultural experiences, all the participants identified the emotions being expressed with a high degree of accuracy (see Ekman, 1998). Even the inhabitants of remote, isolated villages in New Guinea, who had never been exposed to movies or other aspects of Western culture, were able to identify the emotions being expressed. Other research has confirmed and extended Ekman's original findings (see Elfenbein & Ambady, 2002; Frank & Stennett, 2001).

The basic emotions blend with our experiences, personality, and sociocultural milieu to create an infinite degree of shading, blends, and coloring in our emotional world. Much like colors on a color wheel, the existence of basic emotions suggests that cultures shape, mold, and color our emotional lives by using the set of basic emotions as a starting point to create other emotions.

–David Matsumoto (2000)

Other aspects of emotional expression, such as tone of voice and nonverbal expression, also seem to be easily understood across widely different cultures. As anyone who has ever been the target of a sarcastic remark is well aware, the human voice very effectively conveys emotional messages. Several studies have found that people from different cultures can accurately identify the emotion being expressed by tone of voice alone, even when the actual words used were unintelligible (Russell & others,

Anthropomorphism: Happy Dolphins?

Despite the problem of knowing just what an animal is feeling, we often *think* that we do. For example, one reason that dolphins are so appealing is the wide, happy grin they seem to wear. But the dolphin's "smile" is *not* a true facial expression—it's simply the bony curvature of its mouth. If you comment on the friendly, happy appearance of the dolphins frolicking at SeaWorld or another aquarium, you're *projecting* those human emotions onto the dolphins.

You also just committed **anthropomorphism**—you attributed human traits, qualities, or behaviors to a nonhuman animal. The tendency of people to be anthropomorphic is understandable when you consider how extensively most of us were conditioned as children via books, cartoons, and Disney characters to believe that animals are just like people, only with fur or feathers.

From a scientific perspective, anthropomorphism can hinder progress in understanding animal emotions. By assuming that an animal thinks and feels as we do, we run the risk of distorting or obscuring the reality of the animal's own unique experience (de Waal, 2011; Hauser, 2000). Instead, we must acknowledge that other animals are not happy or sad in the same way that humans subjectively experience happiness or sadness.

Animals clearly demonstrate diverse emotions—fear, anger, surprise. But to understand how they subjectively *experience* such feelings—and, indeed, whether they do at all—raises questions that cannot be fully answered at this time. Nonetheless, it seems safe to assume that more primitive animals, like fish, turtles, and snakes, probably do not possess a level of self-awareness that would allow them to experience complex emotions like grief, empathy, or altruism (Hauser, 2000). For more sophisticated animals, like dolphins, primates, and elephants, the evidence is more compelling (Bekoff, 2007; Griffin, 2001).

One subjective aspect of the scientific method is how to interpret evidence and data. In the case of the evidence for animal emotions, the scientific debate is far from over. Although the lack of a definitive answer can be frustrating, keep in mind that such scientific debates play an important role in avoiding erroneous conclusions and shaping future research.



Corbis/Photolibrary

Silly Elephants Elephants form tightly knit family groups. When reunited after a long separation, elephants perform an elaborate greeting ceremony—rumbling, trumpeting, flapping their ears, and spinning around as they rush together, exuberantly intertwining their trunks. Even adult elephants play, sometimes with great enthusiasm, which veteran researcher Cynthia Moss (2000) describes as "elephants acting silly." Female elephants are intensely devoted to their offspring, and family members often touch one another with what looks like affection (Bradshaw & others, 2005).

CRITICAL THINKING QUESTIONS

- What evidence would lead you to conclude that primates, dolphins, or elephants experience emotions?
- Would you accept different evidence to conclude that a 6-month-old human infant can experience emotions? If so, why?
- Is it possible to be completely free of anthropomorphic tendencies in studying animal emotions?

2003; Scherer & others, 2001). Similarly, people from different cultures were able to accurately evaluate the emotional content of video clips depicting an emotional conversation between two people, even though the dialogue was scrambled (Sneddon & others, 2011). And, some body language seems to be universal.

However, some specific nonverbal gestures, which are termed *emblems,* vary across cultures. For example, shaking your head means "no" in the United States but "yes" in southern India and Bulgaria. Nodding your head means "yes" in the United States, but in Japan it could mean "maybe" or even "no way!"

In many situations, you adjust your emotional expressions to make them appropriate in that particular social context. For example, even if you are deeply angered by your supervisor's comments at work, you might consciously restrain yourself and maintain a neutral facial expression. How, when, and where we display our emotional expressions are strongly influenced by cultural norms. Cultural differences in the management of facial expressions are called **display rules** (Ekman & others, 1987; Ambady & others, 2006).

Consider a classic experiment in which a hidden camera recorded the facial expressions of Japanese and Americans as they watched films that showed grisly images of surgery, amputations, and so forth (Ekman & others, 1987; Friesen, 1972). When

anthropomorphism The attribution of human traits, motives, emotions, or behaviors to nonhuman animals or inanimate objects.

display rules Social and cultural regulations governing emotional expression, especially facial expressions.



Happiness Surprise Sadness Anger Disgust Fear

Basic Emotions and Universal Facial Expressions Paul Ekman and his colleagues have precisely calibrated the muscles used in facial expressions for basic emotions, illustrated here in a collection developed by emotion researcher Dacher Keltner (who models "happiness" on the far left). Ekman showed that people in a wide variety of cultures—even those with no experience of western culture—were able to identify facial expressions for each of the basic emotions. You can test your own ability to recognize facial expressions of emotion at http://www.emotionwisegroup.org/emotion-test

All photos EmotionWise Group

they watched the films alone, the Japanese and American participants displayed virtually identical facial expressions, grimacing with disgust and distaste at the gruesome scenes. But when a scientist was present while the participants watched the films, the Japanese masked their negative facial expressions of disgust or fear with smiles. Why? In Japan an important display rule is that you should not reveal negative emotions in the presence of an authority figure so as not to offend the higher-status individual.

Display rules can also vary for different groups within a given culture. For example, recall our earlier discussion about gender differences in emotional expression. In many cultures, including the United States, women are allowed a wider range of emotional expressiveness and responsiveness than men (Fischer & others, 2004). For example, for men, it's considered "unmasculine" to be too open in expressing certain emotions, such as sadness (Johnson & others, 2011). Crying is especially taboo (Vingerhoets & others, 2000).

So what overall conclusions emerge from the research findings on emotional expressions? First, Paul Ekman and other researchers have amassed considerable evidence that facial expressions for the basic emotions—happiness, sadness, anger, fear, surprise, and disgust—are hard-wired into the brain. They also contend that the basic emotions are biologically determined, the result of evolutionary processes. Second, these emotional expressions serve the adaptive function of communicating internal states to friends and enemies. Like the survival of other social animals, human survival depends on being able to recognize and respond quickly to the emotional state of others. Third, although facial expressions for the basic emotions may be biologically programmed, cultural conditioning, gender-role expectations, and other learning experiences shape how, when, and whether emotional responses are displayed.

Theories of Emotion

Explaining Emotion

KEY THEME

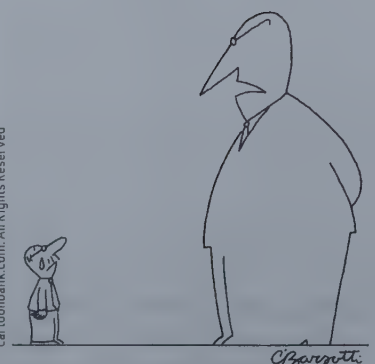
› Emotion theories emphasize different aspects of emotion, but all have influenced the direction of emotion research.

KEY QUESTIONS

› What are the basic principles and key criticisms of the James–Lange theory of emotion?

› How do the facial feedback hypothesis and other contemporary research support aspects of the James–Lange theory?

› What are the two-factor theory and the cognitive appraisal theory of emotion, and how do they emphasize cognitive factors in emotion?



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"Is that one of the emotions people talk about?"

For more than a century, American psychologists have actively debated theories to explain emotion. Like many controversies in psychology, the debate helped shape the direction of psychological research. And, in fact, the earliest psychological theory of emotion, proposed by William James more than a century ago, continues to influence psychological research (Bechara & Naqvi, 2004; Dalgleish, 2004).

In this section, we'll look at the most influential theories of emotion. As you'll see, theories of emotion differ in terms of *which* component of emotion receives the most emphasis—subjective experience, physiological arousal, or expressive behavior.

James–Lange theory of emotion The theory that emotions arise from the perception of body changes.

The James–Lange Theory of Emotion

Do You Run Because You're Afraid? Or Are You Afraid Because You Run?

Imagine that you're walking to your car through the deserted college parking lot late at night. Suddenly, a shadowy figure emerges from behind a parked car. As he starts to move toward you, you walk more quickly. "Hey, what's your hurry?" he calls out, and he picks up his pace.

Your heart starts pounding as you break into a run. Reaching your car, you fumble with the keys, then jump in and lock the doors. Your hands are trembling so badly you can barely get the key into the ignition, but somehow you manage, and you hit the accelerator, zooming out of the parking lot and onto a main street. Still feeling shaky, you ease off the accelerator pedal a bit, wipe your sweaty palms on your jeans, and will yourself to calm down. After several minutes, you breathe a sigh of relief.

In this example, all three emotion components are clearly present. You experienced a subjective feeling that you labeled as "fear." You experienced physical arousal—trembling, sweating, pounding heart, and rapid breathing. And you expressed the fear, both in your facial expression and by bolting into a run. What caused this constellation of effects that you experienced as fear?

The common sense view of emotion would suggest that you (1) recognized a threatening situation and (2) reacted by feeling fearful. This subjective experience of fear (3) activated your sympathetic nervous system and (4) triggered fearful behavior. In one of the first psychological theories of emotion, **William James** (1884) disagreed with this common sense view, proposing a very different explanation of emotion. Danish psychologist Carl Lange proposed a very similar theory at about the same time (see James, 1894; Lange & James, 1922). Thus, this theory, illustrated in Figure 8.10, is known as the **James–Lange theory of emotion.**

Consider our example again. According to the James–Lange theory, your heart didn't pound and you didn't run because you were afraid. Rather, the James–Lange



Corbis

Common sense says we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble.

—William James (1894)

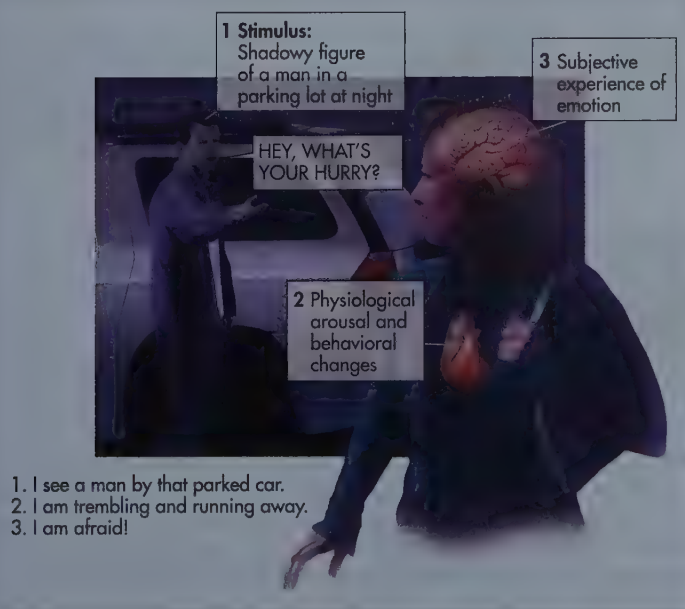


FIGURE 8.10 The James–Lange Theory of Emotion According to William James, we don't tremble and run because we are afraid, we are afraid because we tremble and run. James believed that body signals trigger emotional experience. These signals include physiological arousal and feedback from the muscles involved in behavior. The James–Lange theory inspired a great deal of research, but only limited aspects of the theory have been supported by research evidence.

theory holds that you felt afraid *because* your heart pounded and you ran. Feedback from your physiological arousal and from the muscles involved in your behavior caused your subjective feeling of fearfulness. Thus, James believed that emotion follows this sequence: (1) We perceive a stimulus; (2) physiological and behavioral changes occur, which (3) we experience as a particular emotion.

The James–Lange theory stimulated a great deal of research, much of it consisting of attempts to disprove the theory. In 1927, the famous American physiologist **Walter Cannon** challenged the James–Lange theory. First, Cannon pointed out that body reactions are similar for many emotions, yet our subjective experience of various emotions is very different. For example, both fear and rage are accompanied by increased heart rate, but we have no difficulty distinguishing between the two emotions.

Second, Cannon (1927) argued that our emotional reaction to a stimulus is often faster than our physiological reaction. Here's an example to illustrate this point: Sandy's car started to slide out of control on a wet road. She felt fear as the car began to skid, but it was only *after* the car was under control, a few moments later, that her heart began to pound and her hands started to tremble. Cannon correctly noted that it can take several seconds for the physiological changes caused by activation of the sympathetic nervous system to take effect, but the subjective experience of emotion is often virtually instantaneous.

Third, artificially inducing physiological changes does not necessarily produce a related emotional experience. In one early test of the James–Lange theory, Spanish psychologist Gregorio Marañon (1924) injected several subjects with the hormone *epinephrine,* more commonly known as *adrenaline.* Epinephrine activates the sympathetic nervous system. When asked how they felt, the subjects simply reported the physical changes produced by the drug, saying, "My heart is beating very fast." Some reported feeling "as if" they should be feeling an emotion, but they said they did not feel the emotion itself: "I feel as *if* I were afraid."

James (1894) also proposed that if a person were cut off from feeling body changes, he would not experience true emotions. If he felt anything, he would experience only intellectualized, or "cold," emotions. To test this hypothesis, Cannon and his colleagues (1927) disabled the sympathetic nervous system of cats. But the cats still reacted with catlike rage when barking dogs were present: They hissed, growled, and lifted one paw to defend themselves.

What about humans? The sympathetic nervous system operates via the spinal cord. Thus, it made sense to James (1894) that people with spinal cord injuries would experience a decrease in emotional intensity because they would not be aware of physical arousal or other bodily changes.

Once again, however, research has not supported the James–Lange theory. For example, Dutch psychologist Bob Bermond and his colleagues (1991) found that individuals with spinal cord injuries reported that their experience of fear, anger, grief, sentimentality, and joyfulness had either increased in intensity or was unchanged since their injury. Other researchers have reported similar results (e.g., Cobos & others, 2004; Deady & others, 2010).

Evidence Supporting the James–Lange Theory

On the one hand, you'd think that the James–Lange theory of emotion should be nothing more than a historical artifact at this point. Cannon's critique certainly seemed to demolish it. On the other hand, the brilliance of William James is reflected in the fact that researchers keep finding research support for key points in his theory of emotion.

For example, look back at the Focus on Neuroscience on page 343 describing the PET-scan study by Antonio Damasio and his colleagues (2000). It showed that each of the basic emotions produced a distinct pattern of brain activity, a finding that lends support to the James–Lange theory. To generate a particular basic emotion, the participants were asked to recall an emotionally charged memory and then to signal the researcher when they began subjectively "feeling" the target emotion.

The PET scans showed that areas of the brain's *somatosensory cortex*, which processes sensory information from the skin, muscles, and internal organs, were activated during emotional experiences. Interestingly, these internal changes were registered in the somatosensory cortex *before* the participants reported "feeling" the emotion. Along with demonstrating the importance of internal physiological feedback in emotional experience, Damasio's study supports another basic premise of the James–Lange theory: that physiological changes occur *before* we subjectively experience an emotion.

Other contemporary research has supported James's contention that the perception of internal bodily signals is a fundamental ingredient in the subjective experience of emotion (Dalgleish, 2004). For example, in a study by Hugo Critchley and his colleagues (2004), participants who were highly sensitive to their own internal body signals were more likely to experience anxiety and other negative emotions than people who were less sensitive.



Joel Gordon

Say "Cheese!" Here's a simple test of the facial feedback hypothesis. In a clever study by Fritz Strack and his colleagues (1988), participants who held a pen between their teeth *(left)* thought that cartoons were funnier than participants who held a pen between their lips *(right)*. How does this finding support the facial feedback hypothesis?

Research on the **facial feedback hypothesis** also supports the notion that our bodily responses affect our subjective experience. The facial feedback hypothesis states that expressing a specific emotion, especially facially, causes us to subjectively experience that emotion (Soussignan, 2004). Supporting this are studies showing that when people mimic the facial expressions characteristic of a given emotion, such as anger or fear, they tend to report *feeling* the emotion (Duclos & others, 1989; Schnall & Laird, 2003).

The basic explanation for this phenomenon is that the facial muscles send feedback signals to the brain. In turn, the brain uses this information to activate and regulate emotional experience, intensifying or lessening emotion (Izard, 1990a, 1990b). In line with this explanation, Paul Ekman and Richard Davidson (1993) demonstrated that deliberately creating a "happy" smile produces brain-activity changes similar to those caused by spontaneously producing a happy smile in response to a real event.

A new wrinkle in facial feedback research comes from the popularity of Botox injections to paralyze selected facial muscles to produce a more youthful appearance. Once paralyzed, the targeted muscles no longer send feedback to the brain. Botox injections can dampen emotional experience, although they don't appear to eliminate it completely (Davis & others, 2010; Havas & others, 2010). However, an ingenious study by David Deal and Tanya Chartrand (2011) demonstrated that paralyzing facial muscles with Botox may make people less able to recognize emotional expressions in *other* people. The explanation? We tend to automatically mimic the facial expressions of other people. Although we're not aware of it, feedback from our facial muscles helps us to better understand their emotional displays.

Collectively, the evidence for the facial feedback hypothesis adds support for aspects of the James–Lange theory.

Cognitive Theories of Emotion

A second theory of emotion, proposed by Stanley Schachter and Jerome Singer, was influential for a short time. Schachter and Singer (1962) agreed with James that physiological arousal is a central element in emotion. But they also agreed with Cannon that physiological arousal is very similar for different emotions. Thus, arousal alone would not produce an emotional response.

Instead, Schachter and Singer proposed that we cognitively label physiological arousal as a given emotion based on our appraisal of a situation. Thus, according to the **two-factor theory of emotion,** illustrated in Figure 8.11 on the next page, emotion is the result of the *interaction* of physiological arousal and the cognitive label we use to explain our stirred-up state.

Schachter and Singer (1962) tested their theory in a clever, but flawed, experiment. Male volunteers were injected with epinephrine, which produces sympathetic

facial feedback hypothesis The view that expressing a specific emotion, especially facially, causes the subjective experience of that emotion.

two-factor theory of emotion Schachter and Singer's theory that emotion is the interaction of physiological arousal and the cognitive label that we apply to explain the arousal.

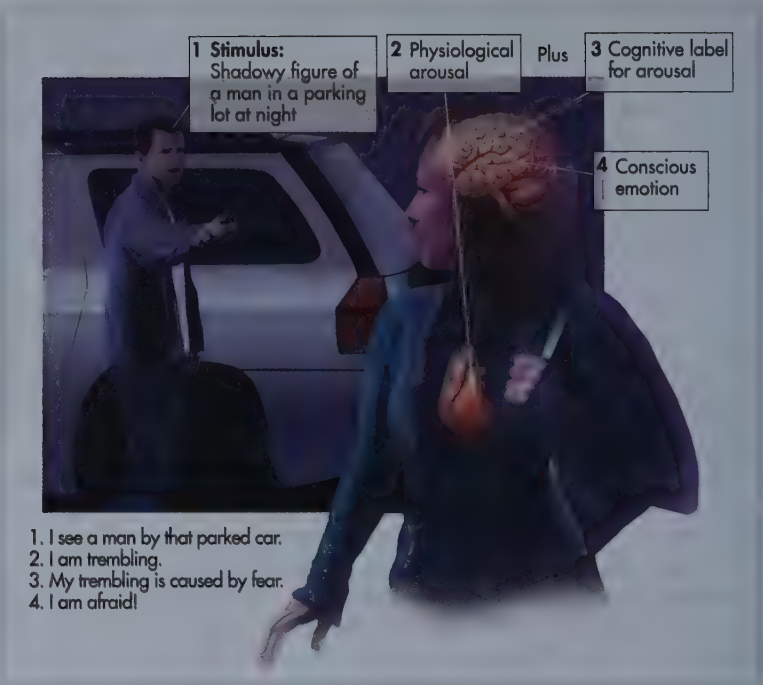


FIGURE 8.11 The Two-Factor Theory of Emotion According to Stanley Schachter and Jerome Singer, emotional experience requires the interaction of two separate factors: (1) physiological arousal and (2) a cognitive *label* for that arousal.

nervous system arousal: accelerated heartbeat, rapid breathing, trembling, and so forth. One group was informed that their symptoms were caused by the injection, but the other group was not given this explanation.

One at a time, the volunteers experienced a situation that was designed to be either irritating or humorous. Schachter and Singer predicted that the subjects who were *informed* that their physical symptoms were caused by the drug injection would be less likely to attribute their symptoms to an emotion caused by the situation. Conversely, the subjects who were *not informed* that their physical symptoms were caused by the drug injection would label their symptoms as an emotion produced by the situation.

The results partially supported their predictions. The subjects who were not informed tended to report feeling either happier or angrier than the informed subjects.

Schachter and Singer's theory inspired a flurry of research. The bottom line of those research efforts? The two-factor theory of emotion received little support (Reisenzein, 1983). Nevertheless, Schachter and Singer's theory stimulated a new line of research on the importance of cognition in emotion (Moors, 2009).

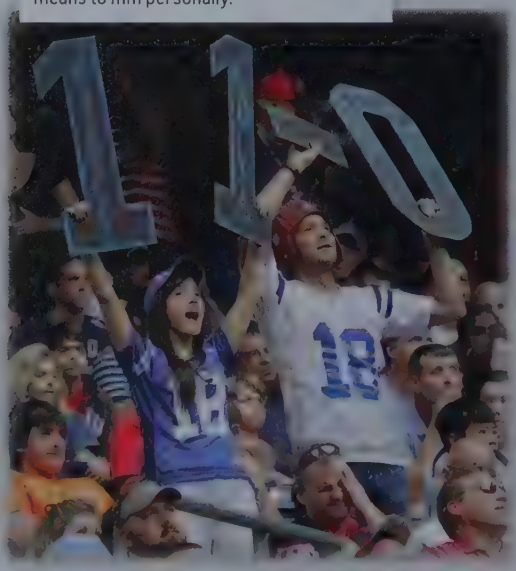
To help illustrate the final theory of emotion that we'll consider, let's go back to the shadowy figure lurking in your college parking lot. Suppose that as the guy called out to you, "Hey, what's your hurry?" you recognized his voice as that of a good friend. Your emotional reaction, of course, would be very different. This simple observation is the basic premise of the **cognitive appraisal theory of emotion.**

Developed by psychologists Craig Smith and Richard Lazarus (1988, 1993), the cognitive appraisal theory of emotion asserts that the most important aspect of an emotional experience is your cognitive interpretation, or *appraisal,* of the situation or stimulus. That is, emotions result from our appraisal of the *personal meaning* of events and experiences. Thus, the same situation might elicit very different emotions in different people (Moors, 2009; Smith & others, 2006).

So, in the case of the shadowy figure in the parking lot, your relief that you were not on the verge of being attacked by a mugger could quickly turn

Appraisal and Emotion: Score!

According to cognitive appraisal theory, how you cognitively appraise the personal significance of an event will determine the emotion that you experience. Go to any popular sports bar during a big playoff game and you'll see evidence of this viewpoint. Two friends, each passionately rooting for a different team, will have very different emotional responses to the winning goal—even though the emotion-producing stimulus is exactly the same. Whether a sports fan experiences elation or dismay depends on what the event means to him personally.



AP Photo/David J. Phillip

to another emotion. If it's a good friend you hadn't seen for a while, your relief might turn to pleasure, even joy. If it's someone that you'd prefer to avoid, relief might transform itself into annoyance or even anger.

At first glance, the cognitive appraisal theory and the Schachter–Singer two-factor theory seem very similar. Both theories emphasize the importance of cognitive appraisal. However, the two-factor theory says that emotion results from physiological arousal *plus* a cognitive label. In contrast, some appraisal theorists stressed that cognitive appraisal *is* the essential trigger for an emotional response (Lazarus, 1995).

Some critics of the cognitive appraisal approach objected that emotional reactions to events were virtually instantaneous—too rapid to allow for the process of cognitive appraisal. Instead, Robert Zajonc suggested (1998, 2000), *we feel first and think later.* Today's emotion researchers recognize that emotions can be triggered in *multiple* ways (Forgas, 2008; Scherer & Ellgring, 2007). Complex stimuli—like social situations or personal interactions—must be cognitively appraised before an emotion is generated. And complex emotional responses—like mixed emotions, pride, shame, or guilt—are likely to involve conscious, cognitive processes (Izard, 2007).

On the other hand, some emotional responses are virtually instantaneous, bypassing conscious consideration. As Joseph LeDoux and other neuroscientists have demonstrated, the human brain can respond to biologically significant threats *without* involving conscious cognitive processes (Kihlstrom & others, 2000). So at least in some instances, we do seem to feel first and think later.

cognitive appraisal theory of emotion The theory that emotional responses are triggered by a cognitive evaluation.

CONCEPT REVIEW 8.3

Emotion

Fill in the blank with the missing name or term.

1. Damage to the brain structure called the _____ disrupts the fear response in human and nonhuman animals.
2. The _____ theory of emotion claims that emotion results from our perceptions of bodily changes; it was challenged by _____.
3. According to the _____ perspective, emotions promote survival by helping us solve adaptive problems posed by our environment.
4. _____ control how people express their emotions in a particular culture.
5. According to the _____ theory of emotion, emotion results from the label we apply to physiological arousal.
6. According to most researchers, the basic emotions are: _____, _____, _____, _____, _____, and _____.
7. Intense emotions like fear, anger, and joy activate the _____ _____ system.
8. According to the _____ theory of emotion, the emotion we feel results from how we evaluate the personal meaning of an event.
9. As you are cleaning out the debris under your grandmother's back porch, you disturb a hissing possum and instinctively jump back in alarm. Your response probably involved a neural pathway connecting the _____ and the _____ in your brain.



CLOSING THOUGHTS

Psychologists have been interested in the topics of motivation and emotion since the very beginning of psychology as a science. Today, psychologists are acutely aware that all motives reflect the dynamic interaction of biological, psychological, and social factors, including cultural forces.

Emotions, too, reflect the interaction among biological factors shaped by evolution and personal, cultural, and social factors. Motivation and emotion are closely intertwined in every person's life. Think back to Randy's story in the chapter prologue. Randy's completion of the Tulsa Run is just one example of how motivational and emotional factors interact to cause and influence behavior.

self-efficacy The degree to which a person is convinced of his or her ability to effectively meet the demands of a particular situation.

As you've read this chapter, we hope you've thought about the multiple factors that influence your own motives and emotional responses in different areas of your life. Finally, in Enhancing Well-Being with Psychology, we'll show you how you can use psychological research to help you achieve *your* goals and aspirations.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Turning Your Goals into Reality

Most people can identify different aspects of their lives they'd like to change. Identifying goals we'd like to achieve is usually easy. Successfully accomplishing these goals is the tricky part. Fortunately, psychological research has identified several strategies and suggestions that can help you get motivated, act, and achieve your goals.

Self-Efficacy: Optimistic Beliefs About Your Capabilities

Your motivation to strive for achievement is closely linked to what you believe about your ability to produce the necessary or desired results in a situation. This is what psychologist Albert Bandura (1997, 2006) calls **self-efficacy**—the degree to which you are convinced of your ability to effectively meet the demands of a particular situation.

Bandura (1997, 2006) has found that if you have an optimistic sense of self-efficacy, you will approach a difficult task as a challenge to be mastered. You will also exert strong motivational effort, persist in the face of obstacles, and look for creative ways to overcome obstacles. If you see yourself as competent and capable, you are more likely to strive for higher personal goals (Bayer & Gollwitzer, 2007; Wood & Bandura, 1991).

People tend to avoid challenging situations or tasks that they *believe* exceed their capabilities (Bandura, 2008). If self-doubts occur, motivation quickly dwindles because the task is perceived as too difficult or threatening. So how do you build your sense of self-efficacy, especially in situations in which your confidence is shaky?

According to Bandura (1991, 2006), the most effective way to strengthen your sense of self-efficacy is through *mastery experiences*—experiencing success at moderately challenging tasks in which you have to overcome obstacles and persevere. As you tackle a challenging task, you should strive for progressive improvement rather than perfection on your first attempt. Understand that setbacks serve a useful purpose in teaching that success usually requires sustained effort. If you experienced only easy successes, you'd be more likely to become disappointed and discouraged, and to abandon your efforts when you did experience failure.

A second strategy is *social modeling*, or *observational learning*. In some situations, the motivation to succeed is present, but you lack the knowledge of exactly how to achieve your goals. In such circumstances, it can be helpful to observe and imitate the behavior of someone who is already competent at the task you want to master (Bandura, 1986, 1990). For example, if you're not certain how to prepare effectively for a test or a class presentation, talk with fellow students who *are* successful in doing this. Ask how they study and what they do when they have difficulty understanding material. Knowing what works is often the critical element in ensuring success.

Implementation Intentions: Turning Goals into Actions

Suppose your sense of self-efficacy is strong, but you still have trouble putting your intentions into action. For example, have you ever made a list of New Year's resolutions and looked back at it six months later? If you're like most people, you'll wonder what went wrong.



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How can you bridge the gap between good intentions and effective, goal-directed behavior? German psychologist Peter Gollwitzer (1999) points out that many people have trouble *initiating* the actions required to fulfill their goals and then *persisting* in these behaviors until the goals are achieved. Gollwitzer and his colleagues (2008, 2010) have identified some simple yet effective techniques that help people translate their good intentions into actual behavior.

Step 1: Form a goal intention.

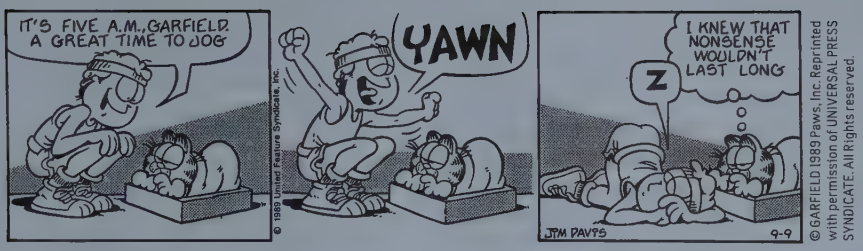
This step involves translating vague, general intentions ("I'm going to do my best") into a specific, concrete, and binding goal. Express the specific goal in terms of "I intend to achieve _____," filling in the blank with the particular behavior or outcome that you wish to achieve. For example, suppose you resolve to exercise more regularly. Transform that general goal into a much more specific goal intention, such as "I intend to work out at the campus gym on Monday, Wednesday, and Friday." Forming the specific goal intention enhances your sense of personal commitment to the goal, and it also heightens your sense of obligation to realize the goal.

Step 2: Create implementation intentions.

This step involves *making a specific plan for turning your good intention into reality.* The trick is to specify exactly where, when, and how you will carry out your intended behavior. Mentally link the intended behaviors to specific situational cues, such as saying, "After my psychology class, I will go to the campus athletic center and work out for 45 minutes." By linking the behavior to specific situational cues, you're more likely to initiate the goal behavior when the critical situation is encountered (Webb & Sheeran, 2007). The ultimate goal of implementation intentions is to create a new automatic link between a specific situation and the desired behavior—and ultimately, to create new habits or routines in your life (Adriaanse & others, 2011).

As simple as this seems, research has demonstrated that forming specific implementation intentions is very effective (Gollwitzer & Sheeran, 2006; Parks-Stamm & others, 2007). For example, one study involved student volunteers with no enticement for participating in the research, such as money or course credit. Just before the students left for the holidays, they were instructed to write an essay describing

GARFIELD



how they spent Christmas Eve. The essay had to be written and mailed within two days after Christmas Eve.

Half of the participants were instructed to write out specific implementation intentions describing exactly when and where they would write the report during the critical 48-hour period. They were also instructed to visualize the chosen opportunity and mentally commit themselves to it.

The other half of the participants were not asked to identify a specific time or place, but just instructed to write and mail the report within the 48 hours. The results? Of those in the implementation intention group, 71 percent wrote and mailed the report by the deadline. Only 32 percent of the other group did so (Gollwitzer & Brandstätter, 1997).

Mental Rehearsal: Visualize the Process

The mental images you create in anticipation of a situation can strongly influence your sense of self-efficacy and self-control as well as the effectiveness of your implementation intentions (Knäuper & others, 2009). For example, students sometimes undermine their own performance by vividly imagining their worst fears, such as becoming overwhelmed by anxiety during a class presentation or going completely blank during a test. However, the opposite is also possible. Mentally visualizing yourself dealing *effectively* with a situation can enhance your performance (Libby & others, 2007; Conway & others, 2004). Athletes, in particular, are aware of this and mentally rehearse their performance prior to competition.

So strive to control your thoughts in an optimistic way by mentally focusing on your capabilities and a positive outcome, not your limitations and worst fears. The key here is not just imagining a positive outcome. Instead, imagine and mentally rehearse the *process*—the skills you will effectively use and the steps you will take—to achieve the outcome *you* want. Go for it!

CHAPTER REVIEW

Motivation and Emotion

KEY POINTS

Introduction: Motivation and Emotion

- **Motivation** refers to the forces that act on or within an organism to initiate and direct behavior. Three characteristics associated with motivation are activation, persistence, and intensity. Motivation is closely tied to emotion—we may be motivated to achieve certain emotions, and emotions may motivate us to take action.

Motivational Concepts and Theories

- During the twentieth century, many psychologists tried to develop general theories of motivation, but each model was too limited to explain all motivated behavior.
- **Instinct theories** of motivation, inspired by evolutionary theory, were limited in that they described and labeled behaviors but did not explain them.
- According to **drive theories,** behavior is motivated by the need to maintain **homeostasis.** Drive theories could not account for psychological motives or motives that are not related to a **drive,** or unmet need.
- According to **incentive theories,** behavior is motivated by external rewards.
- **Arousal theory** is based on the notion that people are motivated to maintain an optimal level of arousal, which can vary from one person to another. People who are high in **sensation seeking** seek high levels of arousal.
- **Humanistic theories of motivation** were based on the idea that people are motivated to achieve their highest potential.

Biological Motivation: *Hunger and Eating*

- Hunger is a biological motive, but eating behavior is also influenced by psychological, social, and cultural factors.
- Food provides **glucose,** the main source of the body's energy, which is regulated by **insulin.** Excess glucose is stored in **adipose tissue.** The **basal metabolic rate (BMR)** is the rate at which your body uses energy for vital body functions. **Energy homeostasis** helps people maintain their baseline body weight, which tends to remain stable over time unless conditions of positive or negative energy balance occur.
- Physiological factors that are correlated with eating are changes in glucose, insulin, **ghrelin,** body temperature, and metabolism. Psychological factors that trigger eating behavior include classically conditioned stimuli and foods that, through operant conditioning and reinforcement, have acquired a **positive incentive value. Satiation** signals include **cholecystokinin (CCK)** and other physiological signals, as well as **sensory-specific satiety.**
- Chemical signals that regulate body weight and help maintain a stable body weight over time include leptin, insulin, **neuropeptide Y,** and ghrelin. These factors are part of a complex feedback loop that also involves the hypothalamus in the brain. In response to a positive or negative energy balance, these factors influence

appetite and metabolism so that body weight remains largely stable over time. The energy balance model is based on **set-point theory.** An alternative view, **settling-point models of weight regulation,** helps explain why baseline body weight can change over time in response to positive or negative energy balance.

- The number of overweight people in the United States and other developed countries has steadily increased in the past decades. **Body mass index (BMI)** is one way to calculate weight status. Someone who is **obese** has a high BMI and an abnormally high proportion of body fat. Factors involved in becoming overweight include inadequate sleep, the ready availability of foods with a positive incentive value, overeating, the **cafeteria diet effect,** individual differences in BMR, and sedentary lifestyles.
- Obesity leads to many health problems, some of which are life threatening. Several factors contribute to obesity, including genetic susceptibility, **leptin resistance,** and frequent dieting, which may lead to **weight cycling.** Obese people tend to have fewer dopamine receptors in their brains than normal-weight individuals, which may lead to compulsive eating to stimulate brain reward centers.

Psychological Needs as Motivators

- According to Abraham Maslow's **hierarchy of needs,** people must fulfill basic physiological needs before they can be motivated by higher psychological needs, such as **self-actualization.** Maslow's model has been very influential, but it lacks empirical support.
- **Self-determination theory (SDT),** developed by Edward Deci and Richard Ryan, is based on the premise that people are motivated to achieve a unified sense of self and integration with others. SDT includes three innate, universal psychological needs: autonomy, competence, and relatedness. **Intrinsic motivation** and **extrinsic motivation** are important principles in SDT.
- **Competence motivation** refers to striving to be capable and exercise control, while **achievement motivation** refers to striving to excel or outperform others. The **Thematic Apperception Test (TAT)** is one way to measure achievement motivation. Achievement motivation is expressed differently in individualistic and collectivistic cultures.

Emotion

- An emotion has three basic components: a subjective experience, a physiological response, and a behavioral or expressive response.
- Emotions have many functions, including triggering motivated behavior, and contribute to rational decision making and purposeful behavior. **Emotional intelligence** is needed to succeed in life. According to evolutionary psychologists, emotions are the product of evolution and help us solve important adaptive problems.
- The **basic emotions** are innate and the product of evolution. Women tend to be more emotionally expressive than men. Emotions can be classified in terms of their degree of activation and pleasantness, and, in collectivistic societies, their level of **interpersonal engagement.**
- Some emotions, such as fear, anger, and happiness, involve arousal of the sympathetic nervous system. The **amygdala** is a key structure in the brain's fear circuit, which also involves the thalamus, the cortex, and the hypothalamus. The amygdala can be activated by threatening stimuli before we are consciously aware of the stimulus, an ability that has adaptive survival value.
- Facial expressions of the basic emotions are biologically innate, culturally universal, and the result of evolution. However, emotional expression is controlled by cultural **display rules.** Display rules also vary by gender, with men more likely to mask their emotions than women.

Theories of Emotion: *Explaining Emotion*

- Emotion theories differ in terms of which emotion component is emphasized. The **James–Lange theory** holds that emotion results from our perception of biological and behavioral responses. Contemporary evidence supporting the James–Lange theory includes neuroscience research demonstrating that we "feel" emotions in our body and the **facial feedback hypothesis.**
- There are two main cognitive theories of emotion. The **two-factor theory,** proposed by Schachter and Singer, holds that emotion results from applying a cognitive label to feelings of arousal. The **cognitive appraisal theory** states that emotional responses are triggered by a cognitive evaluation. Emotion researchers today tend to agree that emotions can be triggered in multiple ways and that instinctive emotional responses may not require a conscious cognitive appraisal.

KEY TERMS

motivation, p. 318
instinct theories, p. 319
drive theories, p. 320
homeostasis, p. 320
drive, p. 320
incentive theories, p. 320
arousal theory, p. 321
sensation seeking, p. 321
humanistic theories of motivation, p. 322
glucose, p. 323
insulin, p. 323
basal metabolic rate (BMR), p. 323
adipose tissue, p. 323
energy homeostasis, p. 323
ghrelin, p. 324
positive incentive value, p. 325
satiation, p. 325
cholecystokinin (CCK), p. 325
sensory-specific satiety, p. 326
leptin, p. 326
neuropeptide Y (NPY), p. 326
set-point theory, p. 327
settling-point models of weight regulation, p. 327
body mass index (BMI), p. 328
obese, p. 328
cafeteria diet effect, p. 329
leptin resistance, p. 331
weight cycling, p. 332
hierarchy of needs, p. 333
self-actualization, p. 334
self-determination theory (SDT), p. 335
intrinsic motivation, p. 335
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Thematic Apperception Test (TAT), p. 336
emotion, p. 338
emotional intelligence, p. 338
basic emotions, p. 339
interpersonal engagement, p. 340
amygdala, p. 342
anthropomorphism, p. 347
display rules, p. 347
James–Lange theory of emotion, p. 349
facial feedback hypothesis, p. 351
two-factor theory of emotion, p. 351
cognitive appraisal theory of emotion, p. 352
self-efficacy, p. 354

KEY PEOPLE

Walter Cannon (1871–1945) American physiologist who developed an influential theory of emotion called the Cannon–Bard theory of emotion. (p. 350)

Charles Darwin (1809–1882) English naturalist and scientist (also see Chapter 1) whose theory of evolution through natural selection was first published in *On the Origin of Species by Means of Natural Selection* in 1859. (p. 339)

Edward L. Deci (b. 1942) American psychologist who, along with Richard M. Ryan, developed self-determination theory, which contends that optimal psychological functioning and growth can occur only if the psychological needs of autonomy, competence, and relatedness are satisfied. (p. 335)

Paul Ekman (b. 1934) American psychologist and emotion researcher who is best known for his work in classifying basic emotions, analyzing facial expressions, and demonstrating that basic emotions and facial expressions are culturally universal. (p. 345)

William James (1842–1910) American psychologist (also see Chapters 1 and 4) who developed an influential theory of emotion called the James–Lange theory. (p. 349)

Abraham Maslow (1908–1970) American psychologist and a founder of humanistic psychology who developed a hierarchical model of human motivation in which basic needs must first be satisfied before people can strive for self-actualization. (p. 333)

Richard M. Ryan (b. 1953) American psychologist who, along with Edward L. Deci, developed self-determination theory, which contends that optimal psychological functioning and growth can occur only if the psychological needs of autonomy, competence, and relatedness are satisfied. (p. 335)

CONCEPT REVIEW ANSWERS

8.1 page 332

1. False 2. False 3. False 4. True
5. False 6. False 7. True

8.2 page 337

1. c 2. b 3. d 4. a

8.3 page 353

1. amygdala
2. James–Lange; Walter Cannon
3. evolutionary
4. Display rules
5. two-factor
6. fear, surprise, anger, disgust, happiness, sadness
7. sympathetic nervous
8. cognitive appraisal
9. thalamus; amygdala



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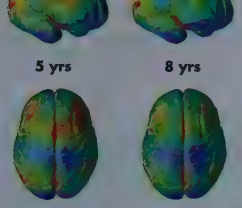




CHAPTER 9

Lifespan Development









Future Plans

PROLOGUE

WE'VE MOVED A COUPLE OF TIMES since we began the first edition of this textbook. Although we know the drill, moving never seems to go smoothly. Despite the best of intentions, the night before the moving van shows up is always a chaotic, frenzied scene. Jumbled piles of random objects get frantically tossed into boxes. "This can all get sorted out later," we reason. This rationalization works well until "later" actually arrives and we're confronted by the sea of boxes marked "basement," "files," and "miscellaneous."

Moving is one of those events that forces you to reflect on your past. Memories are unearthed from the corners of drawers, pantry shelves, and storage cabinets. Don's sky-diving and pilot manuals, found at the bottom of a dilapidated cardboard box. Sandy's rock tumbler. Laura's preschool artwork.

And episodes from the lives of others, too. From one dusty box, Laura gently pulled a carefully wrapped, framed picture. It was a hand-colored portrait photo of a beautiful young woman with delicate features and a sweet, tentative smile.

"That's Grandma Fern, when she was about your age," Sandy said. "Wasn't she pretty?" Sandy reached into the box, uncovering another treasure, "Look, here's Grandpa Erv and Grandma Fern's wedding photo."

"How come Grandma isn't wearing a wedding dress?" Laura asked.

"Well, they got married right after World War II. It was the style then to wear a tailored suit. Nobody had extra money, and there were all kinds of shortages. Just think—Fernie was only 19 years old, not much older than you are now!"

"What's this old thing?" Laura asked, holding up a crumbling cardboard mailing tube with a half-cent postage stamp still on it. Sandy pulled an engraved certificate out of the tube and carefully unrolled it. She read, *"This certifies that Erwin Schmidt has been awarded membership in the '49ers, an organization of young businessmen chosen from among the boy salesmen of Liberty Weekly. He has been selected because of his exceptional sales achievements, outstanding character, splendid personality, and unquestioned loyalty to his duties."* Shaking her head in amazement, Sandy said, "It's dated October 10, 1930. Erv would have been only 12 years old. I can't believe he saved this for all those years."

All of us are shaped by the communities in which we grow up. In Fern's case, that community was a tiny farming town in the 1930s. In contrast to Fern's childhood spent caring for her younger siblings in rural Wisconsin, Erv was an only child in the thriving German community of Chicago's Lincoln Square in the 1920s. Fern's stories of chasing chickens to catch and kill

IN THIS CHAPTER:

- Introduction: Your Life Story
- Genetic Contributions to Your Life Story
- Prenatal Development
- Development During Infancy and Childhood
- Adolescence
- Adult Development
- Late Adulthood and Aging
- The Final Chapter: Dying and Death
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Raising Psychologically Healthy Children

for Sunday dinner were hard for her children and grandchildren to believe. But so were Erv's stories of roller-skating down Chicago streets and sleeping on fire escapes on hot summer nights in the city.

We're also profoundly influenced by historical events. Just as the Great Depression defined Fern's and Erv's childhoods, World War II defined their young adult years. Among the treasures we discovered were shoeboxes filled with curling black-and-white snapshots that Erv took of his buddies at the Army Air Force's training camp right before he "shipped out" for the Philippines and New Guinea.

"Mom, what is this thing?" Laura asked, pulling a dangerous-looking tool from a dusty canvas U.S. Army surplus bag.

"That's my rock pick," Sandy replied. "Be careful with that—it's pretty sharp. Just think, I used to be able to take that onboard with me when I flew out west to go rock collecting."

"Seriously?" Laura said in disbelief. Of course, Laura doesn't remember a time when people got on planes without having their carry-on luggage searched for potential weapons. "Threat level: Orange" is an accepted part of daily life for her generation, just as bread lines and victory gardens were for her grandparents.



Laura had her own boxes of memories: Legos, Beanie Babies, and Barbies. Another box held college catalogs, SAT practice tests, programs from high school events, and pictures of friends. And then there were the stacks of T-shirts, commemorating everything from state soccer championships to volunteering at the Oklahoma Firefighters' Burn Camp.

"You really need to sort through all that stuff and decide what you want to keep," Sandy said.

Why did Erv keep his faded award certificate? Or his gymnastics medals, high school report cards, and an eighth-grade autograph book that Sandy found carefully preserved in an old cigar box? Why did Don keep all of his pilot logs, his skydiving manuals, and his father's cufflinks? For that matter, why did Sandy still have her rock pick?

It's a task that each of us faces. Sorting out our past, framing our future. Who have we been? Who shall we become? What will our life story be?



Introduction: Your Life Story

KEY THEME

› Developmental psychology is the study of how people change over the lifespan.

KEY QUESTIONS

› What are the eight basic stages of the lifespan?

› What are some of the key themes in developmental psychology?

One way to look at the "big picture" of your life is to think of your life as a story. You, of course, are the main character. Your life story so far has had a distinct plot, occasional subplots, and a cast of supporting characters, including family, friends, and lovers.

Like every other person's life story, yours has been influenced by factors beyond your control. One such factor is the unique combination of genes you inherited from your biological mother and father. Another is the historical era during which you grew up. Your individual development has also been shaped by the cultural, social, and family contexts within which you were raised.

The patterns of your life story, and the life stories of countless other people, are the focus of **developmental psychology**—the study of how people change physically, mentally, and socially throughout the lifespan. Developmental psychologists investigate the influence of biological, environmental, social, cultural, and behavioral factors on development at every age and stage of life.

developmental psychology The branch of psychology that studies how people change over the lifespan.



Chederros/agefotostock



Corbis Flirt/Alamy

Continuity and Change Over the Lifespan The twin themes of continuity and change throughout the lifespan are evident in the changing nature of relationships. Childhood friendships center on sharing activities, while peer relationships in adolescence emphasize sharing thoughts and feelings. Early adulthood brings the challenge of forming intimate relationships and for some, beginning a family. Close relationships with friends and family continue to contribute to psychological well-being in late adulthood.



Ariel Skelley/Corbis



Ariel Skelley/Corbis

However, the impact of these factors on individual development is greatly influenced by attitudes, perceptions, and personality characteristics. For example, the adjustment to middle school may be a breeze for one child but a nightmare for another. So, although we are influenced by the events we experience, we also shape the meaning and consequences of those events.

Along with studying common patterns of growth and change, developmental psychologists look at the ways in which people *differ* in their development and life stories. As we'll note several times in this chapter, the typical, or "normal," pattern of development can also vary across cultures (Kagan, 2011; Molitor & Hsu, 2011).

Developmental psychologists often conceptualize the lifespan in terms of basic *stages* of development (see Table 9.1). Traditionally, the stages of the lifespan are defined by age, which implies that we experience relatively sudden, age-related changes as we move from one stage to the next. Indeed, some of life's transitions *are* rather abrupt, such as entering the workforce, becoming a parent, or retiring. And some aspects of development, such as prenatal development and language development, are closely tied to *critical periods,* which are periods during which a child is maximally sensitive to environmental influences.

Still, most of our physical, mental, and social changes occur gradually. As we trace the typical course of human development in this chapter, the theme of *gradually unfolding changes* throughout the ages and stages of life will become more evident. Another important theme in developmental psychology is the *interaction between heredity and environment.* Traditionally, this was called the *nature–nurture* issue. Although we are born with a specific genetic potential that we inherit from our biological parents, our environment influences how, when, and whether that potential is expressed. In turn, our genetic inheritance influences the ways in which we experience and interact with the environment (Diamond, 2009; Meaney, 2010).

TABLE 9.1

Major Stages of the Lifespan

Stage	Age Range
Prenatal	Conception to birth
Infancy and toddlerhood	Birth to 2 years
Early childhood	2 to 6 years
Middle childhood	6 to 12 years
Adolescence	12 to 18 years
Young adulthood	18 to 40 years
Middle adulthood	40 to 65 years
Late adulthood	65 years to death

The Chapters in Your Life Story If you think of your life as an unfolding story, then the major stages of the human lifespan represent the different "chapters" of your life. Each chapter is characterized by fundamentally different physical, cognitive, and social transitions, challenges and opportunities, demands and adjustments. Comparing different life stories reveals many striking similarities in the developmental themes of any given stage. Nevertheless, every life story is unique.

Developmental psychology is a broad field, covering a wide range of topics from many different perspectives. Our goal in this chapter is not to try to survey the entire field of lifespan development. Rather, we'll focus on presenting some of the most influential theories in developmental psychology and the key themes that have guided research on each stage of the lifespan. As we do so, we'll describe the typical patterns of development while noting the importance of individual variation.



Genetic Contributions to Your Life Story

KEY THEME

› Your genotype consists of the chromosomes inherited from your biological parents, but your phenotype—the actual characteristics you display—results from the interaction of genetics and environmental factors.

KEY QUESTIONS

› What are DNA, chromosomes, and genes?

› What role does the environment play in the relationship between genotype and phenotype?

› What is epigenetics?

- **zygote** The single cell formed at conception from the union of the egg cell and sperm cell.
- **chromosome** A long, thread-like structure composed of twisted parallel strands of DNA; found in the cell nucleus.
- **deoxyribonucleic acid (DNA)** The double-stranded molecule that encodes genetic instructions; the chemical basis of heredity.
- **gene** A unit of DNA on a chromosome that encodes instructions for making a particular protein molecule; the basic unit of heredity.
- **genotype** (JEEN-oh-type) The genetic makeup of an individual organism.
- **allele** (ah-LEEL) One of the different forms of a particular gene.
- **sex chromosomes** Chromosomes, designated as X or Y, that determine biological sex; the 23rd pair of chromosomes in humans.
- **phenotype** (FEEN-oh-type) The observable traits or characteristics of an organism as determined by the interaction of genetics and environmental factors.

You began your life as a **zygote,** a single cell no larger than the period at the end of this sentence. Packed in that tiny cell was the unique set of genetic instructions that you inherited from your biological parents. Today, that same set of genetic information is found in the nucleus of nearly every cell of your body.

What form does this genetic data take? The genetic data you inherited from your biological parents is encoded in the chemical structure of the **chromosomes** that are found in the cell nucleus. As depicted in Figure 9.1, each chromosome is a long, thread-like structure composed of twisted parallel strands of **deoxyribonucleic acid,** abbreviated DNA. Put simply, **DNA** stores the inherited information that guides the development of all living organisms.

Each of your chromosomes has thousands of DNA segments, called **genes,** that are strung like beads along its length. Each gene is a unit of DNA code for making a particular protein molecule. Interestingly, genes actually make up less than 2 percent of human DNA (Human Genome Program, 2008). Determining the functions of the rest of the DNA is an active area of investigation. This DNA was once referred to as "junk DNA," but most researchers today believe that it is involved in regulating gene functioning (Parker & others, 2009; McDaniell & others, 2010).

What do genes do? In a nutshell, genes direct the manufacture of proteins. Proteins are used in virtually all of your body's functions—from building cells to manufacturing hormones to regulating brain activity. Your body requires hundreds of thousands of different proteins to function. Each protein is formed by a specific combination of amino acids, and that combination is encoded in a particular gene.

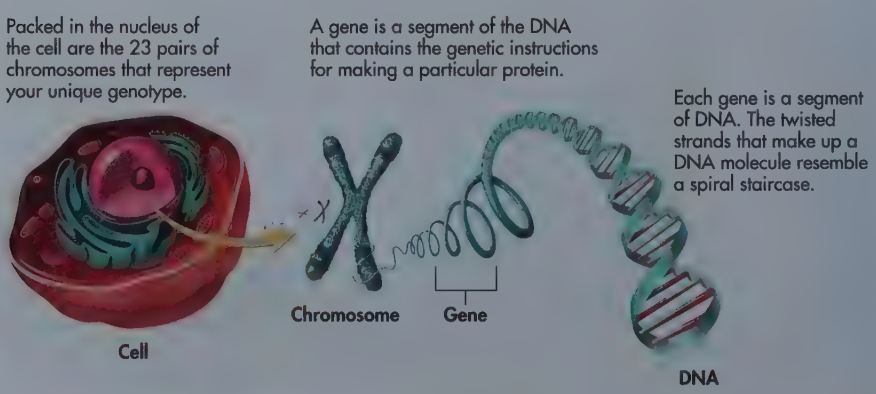
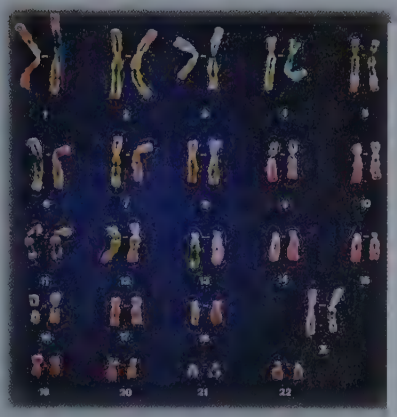


FIGURE 9.1 Chromosomes, Genes, and DNA Each chromosome contains thousands of genes, and each gene is a unit of DNA instructions. Incredibly fine, the strands of DNA in a single human cell would be more than three inches long if unraveled. If the DNA present in one person were unraveled, it would stretch from Earth to Pluto and back—*twice!*

Your Unique Genotype

At fertilization, your biological mother's egg cell and your biological father's sperm cell each contributed 23 chromosomes. This set of 23 chromosome pairs represents your unique **genotype** or genetic makeup. With the exception of the reproductive cells (sperm or eggs), every cell in your body contains a complete, identical copy of your genotype.

In recent years, scientists mapped out the *human genome*—the complete set of DNA in the human organism (Lander & others, 2001; Venter & others, 2001). One unexpected discovery was that the complete human genome contains only about 20,000 to 25,000 protein-coding genes, far fewer than previous estimates that put the number as high as 100,000 genes.



AP Photo/Fab Science Photo Library/Photo Researchers Ian Bimmer

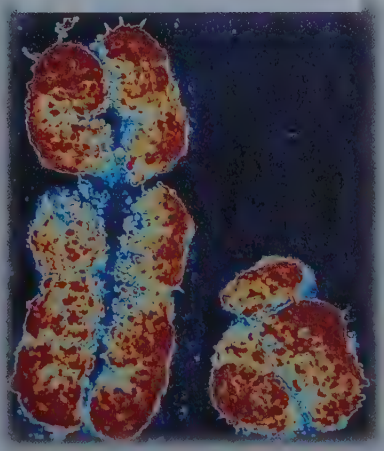
The 23 Pairs of Human Chromosomes Each person's unique genotype is represented in the 23 pairs of chromosomes found in the nucleus of almost all human body cells. This photograph, taken through a microscope, depicts a *karyotype*, which shows one cell's complete set of chromosomes. By convention, the chromosomes are arranged in pairs from largest to smallest, numbered from 1 to 22. The 23rd pair of chromosomes, called the **sex chromosomes**, determines a person's biological sex. The sex chromosomes in this karyotype are XX, indicating a female. A male karyotype would have an XY combination.

Although all humans have the same basic set of genes, these genes can come in different versions, called **alleles.** As a general rule, your genotype contains two copies of each gene—one inherited from each biological parent. These genes may be identical or different. The range of potential alleles varies for individual genes (Ku & others, 2010). Some genes have just a few different versions, while other genes have 50 or more possible alleles. It is this unique combination of alleles that helps make your genotype—and you—unique.

The best-known, although not the most common, pattern of allele variation is the simple dominant–recessive gene pair. For example, the development of freckles appears to be controlled by a single gene, which can be either dominant or recessive (Sulem & others, 2007). If you inherit a dominant version of the freckles gene from either or both of your biological parents, you'll have the potential to display freckles. But to be freckle-free, you would have to inherit two recessive "no freckles" genes, one from each biological parent.

Unlike freckles, most characteristics involve the interaction of *multiple* genes (Buchanan & others, 2009). For these characteristics, each gene contributes only a small amount of influence to a particular characteristic.

Human Sex Chromosomes: X and Y Biological sex is determined by the 23rd pair of chromosomes, the *sex chromosomes*. While every egg cell has one X chromosome, every sperm cell has either one X or one Y chromosome. Whether a zygote develops into a male or a female depends on whether the egg is fertilized by a sperm cell with a Y chromosome (XY, resulting in a male) or by a sperm cell with an X chromosome (XX, resulting in a female). Notice that the X chromosome (*left*) is larger and has more genes than the Y chromosome (*right*). This confers some protection against certain genetic disorders for females. Why? Because by having two X chromosomes, females with a disease-producing allele are more likely to also have a normal allele to override it. This is why males are more likely to display various genetic disorders, such as red–green color blindness and hemophilia.



Biophoto Associates/Photo Researchers

From Genotype to Phenotype

While the term *genotype* refers to an organism's unique genetic makeup, the term **phenotype** refers to the characteristics that are actually observed in an organism. At one time, the genotype was commonly described as a "genetic blueprint," which implied that the genotype was a fixed, master plan, like an architectural blueprint. It was thought that a person's inherited genotype directed and controlled virtually all aspects of development as it unfolded over the lifespan (Dar-Nimrod & Heine, 2011). But research has shown that the genetic blueprint analogy is *not* accurate.

The first problem with the genotype-as-blueprint analogy is that genes don't *directly* control development, traits, or behaviors (Zhang & Meaney, 2010). Rather, as explained above, genes direct the production of the thousands of different proteins that are the building blocks of all body tissues and structures—which ultimately *do* influence your development and behavior.

Second, environmental factors influence the phenotype you display. For example, even if your genotype contains a copy of the dominant "freckles" gene, you will *not* develop freckles unless the expression of that dominant gene is triggered by a specific environmental factor: sunlight. On the other hand, if you carry two recessive "no freckles" genes, you won't develop freckles no matter how much time you spend in the sunlight.

Here's the important point: *Different genotypes react differently to environmental factors* (Masterpasqua, 2009). Thus, psychologists and other scientists often speak of *genetic predispositions* to develop in a particular way (Champagne & Mashoodh,

Most of the genes in each person are dormant. Experience affects which genes are turned on (and off), and when. Thus, the environment participates in sculpting expression of the genome.

Adele Diamond (2009)

2009). In other words, people with a particular genetic configuration will be more or less sensitive to particular environmental factors. For example, think of people you know who sunburn easily, such as redheads or people with very fair skin. Their genotype is especially sensitive to the effects of ultraviolet light. One person's freckle factory is another person's light tan—or searing sunburn.

The New Science of Epigenetics

Each of us started life as a single-celled zygote that divided and multiplied. Each new cell contained the exact same set of genetic instructions. Yet some of those cells developed into bones, hair, eyes, joints, lungs, or other specialized tissues. Why, then, are cells so different? How does the single-celled zygote develop into a complex, differentiated organism with kidneys, eyelashes, kneecaps, and a navel?

The dramatic differences among the size, shape, and function of cells are due to *which* genes are "expressed," or activated to participate in protein production. Put simply, cells develop differently because different genes are activated at different times. Some genes are active for just a few hours, others for a lifetime. Many genes are *never* expressed. For example, humans carry all of the genes to develop a tail, but we don't develop a tail because those genes are never activated.

What triggers a gene to activate? Gene expression can be triggered by the activity of *other* genes, internal chemical changes, or by external environmental factors, such as sunlight in our earlier freckles example. Thus, gene expression is *flexible,* responsive to both internal and external factors (Litvin & others, 2009; Meaney, 2010).

Scientists have only recently begun to understand the processes that regulate gene expression. This new field is called **epigenetics**–the study of the mechanisms that control gene expression and its effects on behavior and health (Meaney, 2010; Zhang & Meaney, 2010). For any given cell, it's the epigenetic "settings" that determine whether it will become a skin cell, a nerve cell, or a heart muscle cell. Thus, epigenetics investigates how gene activity is regulated within a cell, such as identifying the signals that switch genes to "on" or "off."

To help illustrate epigenetic influences, consider identical twins, who develop from a single zygote. Each twin inherits exactly the same set of genes. Yet, as twins develop, differences in physical and psychological characteristics become evident. These differences are due to epigenetic changes—differences in the expression of each twin's genes, *not* to their underlying DNA, which is still identical (Champagne & Mashoodh, 2009; Fraga & others, 2005).

Epigenetic research is providing new insights into *how* the environment affects gene expression and the phenotype (Champagne, 2010). For example, consider the groundbreaking series of experiments conducted by teams led by Canadian neuroscientist Michael Meaney (2001, 2010). He showed that newborn rats that were genetically predisposed to be skittish, nervous, and high-strung would develop into calm, exploratory, and stress-resistant adult rats when raised by genetically unrelated, attentive mother rats. Conversely, newborn rats that were genetically predisposed to be calm and stress resistant grew up to be nervous, high-strung, and easily stressed out when they were raised by *inattentive,* genetically unrelated mother rats.

The important point is that although the rats' DNA did *not* change, the chemical tags that control gene expression *did* change. The rats' upbringing set in motion a cascade of epigenetic changes that changed their brain chemistry and literally "reprogrammed" their future behavior (see Hyman, 2009; Sapolsky, 2004). Surprisingly, the influence of their upbringing extended to the *next* generation: The calm, stress-resistant rats grew up to be attentive mothers to their own offspring.

The old "nature versus nurture" debate has long since receded into scientific irrelevance. Instead, the frontier lies in understanding the mechanisms by which environmental factors—whether experiential, metabolic, microbiological, or pharmacologic—interact with the genome to influence brain development and to produce diverse forms of neural plasticity over the lifetime.

Steven E. Hyman (2009)

Psychologists and other scientists are beginning to identify epigenetic influences in humans. One area of active study is the impact of early stress (see Champagne, 2010). Would childhood stress or adversity produce a recognizable pattern of epigenetic changes, in adult *humans,* as it does in adult rats? One study found that suicide victims who had been abused as children had distinct epigenetic marks in brain tissue that were *not* found in accident or in suicide victims who had not been abused as children (McGowan & others, 2009).

Interactions among genes, and between the genotype and environmental influences, are two critical factors in the relationship between genotype and phenotype. Beyond these factors, genes can also *mutate,* or spontaneously change, from one generation to the next. Further, DNA itself can be damaged by environmental factors, such as exposure to ultraviolet light, radiation, or chemical toxins. Just as a typo in a recipe can ruin a favorite dish, errors in the genetic code can disrupt the production of the correct proteins and lead to birth defects or genetic disorders.

epigenetics The study of the cellular mechanisms that control gene expression and of the ways that gene expression impacts health and behavior.

prenatal stage The stage of development before birth; divided into the germinal, embryonic, and fetal periods.

germinal period The first two weeks of prenatal development.

embryonic period The second period of prenatal development, extending from the third week through the eighth week.

teratogens Harmful agents or substances that can cause malformations or defects in an embryo or fetus.

Prenatal Development

KEY THEME

› During the prenatal stage, the single-celled zygote develops into a full-term fetus.

KEY QUESTIONS

› What are the three stages of prenatal development?

› How does the brain develop?

› What are teratogens?

At conception, chromosomes from the biological mother and father combine to form a single cell—the fertilized egg, or *zygote.* Over the relatively brief span of nine months, that single cell develops into the estimated trillion cells that make up a newborn baby. This **prenatal stage** has three distinct phases: the germinal period, the embryonic period, and the fetal period (see photos).

The Germinal and Embryonic Periods

The **germinal period,** also called the *zygotic period,* represents the first two weeks of prenatal development. During this time, the zygote undergoes rapid cell division before becoming implanted on the wall of the mother's uterus. Some of the zygote's cells will eventually form the structures that house and protect the developing fetus and provide nourishment from the mother. By the end of the two-week germinal period, the single-celled zygote has developed into a cluster of cells called the *embryo.*

The **embryonic period** begins with week 3 and extends through week 8. During this time of rapid growth and intensive cell differentiation, the organs and major systems of the body form. Genes on the sex chromosomes and hormonal influences also trigger the initial development of the sex organs.

Protectively housed in the fluid-filled *amniotic sac,* the embryo's lifeline is the umbilical cord. Extending from the placenta on the mother's uterine wall to the embryo's abdominal area, the *umbilical cord* delivers nourishment, oxygen, and water, and carries away carbon dioxide and other wastes. The *placenta* is actually a disk-shaped, vascular organ that prevents the mother's blood from directly mingling with that of the developing embryo. Acting as a filter, the placenta prevents many harmful substances that might be present in the mother's blood from reaching the embryo.

The placenta cannot, however, filter out all harmful agents from the mother's blood. Harmful agents or substances that can cause abnormal development or birth defects are called **teratogens.** Generally, the greatest vulnerability to teratogens occurs during the embryonic stage, when major body systems are forming. However, some

Prenatal Development Although it is less than an inch long, the beginnings of arms, legs, and fingers can already be distinguished in the 7-week-old embryo (*top left*). The amniotic sac can be clearly seen in this photograph. The fetus at 4 months (*top right*) measures 6 to 10 inches long, and the mother may be able to feel the fetus's movements. Notice the well-formed umbilical cord. Near full term (*bottom*), the 8-month-old fetus gains body fat to help the newborn survive outside the mother's uterus.



(all) Petit Format/Nestle/Science Source/Photo Researchers

substances, such as cocaine, cigarette smoke, or alcohol, can damage the developing fetus at any stage before birth. Known teratogens include:

- Exposure to radiation
- Toxic chemicals and metals, such as mercury, PCBs, and lead
- Viruses and bacteria, such as German measles (rubella), syphilis, genital herpes, and human immunodeficiency virus (HIV)
- Prescription painkillers and other prescription and nonprescription drugs
- Addictive drugs, including heroin, sedatives, cocaine, amphetamines, and methamphetamine
- Maternal smoking and exposure to second-hand smoke
- Alcohol

Alcohol deserves special mention. Although drinking alcohol at any point during pregnancy can harm the fetus, the greatest risk is during the first trimester of prenatal development, when the brain and major organs are developing. Excessive drinking can cause *fetal alcohol syndrome,* which is characterized by physical and mental problems (Sokol & others, 2003). Symptoms include abnormal facial features, poor coordination, learning disabilities, behavior problems, and mental retardation. Binge drinking is especially harmful to the developing fetus, but most researchers believe that there is *no* safe level of alcohol use during pregnancy.

Finally, the mother's psychological state can affect the unborn child. Chronic stress, depression, and anxiety are associated with low birth weight and premature birth (see Dunkel Schetter, 2011). Poor nutrition, lack of sleep, and other unhealthy behaviors can also affect the unborn child's growth and development.

By the end of the embryonic period, the embryo has grown from a cluster of a few hundred cells no bigger than the head of a pin to over an inch in length. Now weighing about an ounce, the embryo looks distinctly human, even though its head accounts for about half its body size.

Prenatal Brain Development

By three weeks after conception, a sheet of primitive neural cells has formed. Just as you might roll a piece of paper to make a tube, this sheet of neural cells curls to form the hollow *neural tube.* The neural tube is lined with **stem cells,** which are cells that can divide indefinitely, renew themselves, and give rise to a variety of other types of cells. At four weeks, this structure is about the size of a grain of salt. At seven weeks it is about a quarter-inch long.

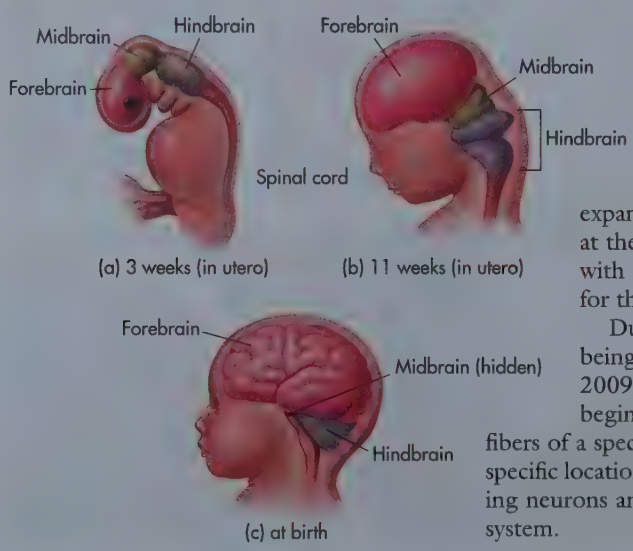


FIGURE 9.2 The Sequence of Fetal Brain Development The human brain begins as a fluid-filled neural tube at about three weeks after conception. The hindbrain structures are the first to develop, followed by midbrain structures. The forebrain structures develop last, eventually coming to surround and envelop the hindbrain and midbrain structures.

The neural stem cells divide and multiply, producing other specialized cells that eventually give rise to neurons and glial cells. Gradually, the top of the neural tube thickens into three bulges that will eventually form the three main regions of the brain: the *hindbrain, midbrain,* and *forebrain* (see Figure 9.2). As the neural tube expands, it develops the cavities, called *ventricles,* that are found at the core of the fully developed brain. The ventricles are filled with cerebrospinal fluid, which cushions and provides nutrients for the brain and spinal cord.

During peak periods of brain development, new neurons are being generated at the rate of 250,000 per minute (McDonald, 2009). The developing brain cells multiply, differentiate, and begin their migration to their final destination. Guided by the fibers of a special type of glial cell, the newly generated neurons travel to specific locations (Bystron & others, 2008). They join with other developing neurons and begin forming the structures of the developing nervous system.

The Fetal Period

stem cells Undifferentiated cells that can divide and give rise to cells that can develop into any one of the body's different cell types.

fetal period The third and longest period of prenatal development, extending from the ninth week until birth.

The third month heralds the beginning of the **fetal period**—the final and longest stage of prenatal development. The main task during the next seven months is for body systems to grow and reach maturity in preparation for life outside the mother's body. By the end of the third month, the fetus can move its arms, legs, mouth, and head. The fetus becomes capable of reflexive responses, such as fanning its toes if the sole of the foot is stroked and squinting if its eyelids are touched. During the fourth month, the mother experiences *quickening*—she can feel the fetus moving.

The fetal brain is constantly changing, forming as many as 2 million synaptic connections per second. Connections that are used are strengthened, while connections that remain unused are eventually *pruned* or eliminated. The fetus now has distinct sleep–wake cycles and periods of activity (Mirmiran & others, 2003). During the sixth month, the fetus's brain activity becomes similar to that of a newborn baby.

During the final two months of the fetal period, the fetus will double in weight, gaining an additional three to four pounds of body fat. This additional body fat will help the newborn adjust to changing temperatures outside the womb. It also contributes to the newborn's chubby appearance. As birth approaches, growth slows and the fetus's body systems become more active.

At birth, the newborn's brain is only about one-fourth the size of an adult brain, weighing less than a pound. After birth, the neurons grow in size and continue to develop new dendrites and interconnections with other neurons. *Myelin* forms on axons in key areas of the brain, such as those involved in motor control (Jakovcevski & others, 2009). Axons also grow longer, and the branching at the ends of the axons becomes more dense. But the process of neural development has only begun. The development of dendrites and synapses, as well as the extension of axons, continues throughout the lifespan.

Development During Infancy and Childhood

KEY THEME

› Although physically helpless, newborn infants are equipped with reflexes and sensory capabilities that enhance their chances for survival.

KEY QUESTIONS

› How do the senses and the brain develop after birth?

› What roles do temperament and attachment play in social and personality development?

› What are the stages of language development?

The newly born infant enters the world with an impressive array of physical and sensory capabilities. Initially, his behavior is mostly limited to reflexes that enhance his chances for survival. Touching the newborn's cheek triggers the *rooting reflex*—the infant turns toward the source of the touch and opens his mouth. Touching the newborn's lips evokes the *sucking reflex*. If you put a finger on each of the newborn's palms, he will respond with the *grasping reflex*—the baby will grip your fingers so tightly that he can be lifted upright. As motor areas of the infant's brain develop over the first year of life, the rooting, sucking, and grasping reflexes are replaced by voluntary behaviors.

The newborn's senses—vision, hearing, smell, and touch—are keenly attuned to people. In a classic study, Robert Fantz (1961) demonstrated that the image of a human face holds the newborn's gaze longer than do other images. Other researchers have also confirmed the newborn's visual preference for the human face (Pascalis & Kelly, 2009). Newborns only 10 *minutes* old will turn their heads to continue gazing at the image of a human face as it passes in front of them, but they will not visually follow other images (Turati, 2004).

The Nearsighted Newborn Classic research by psychologist Robert Fantz and his colleagues (1962) showed that the newborn comes into the world very nearsighted, having approximately 20/300 vision. The newborn's ability to detect the contrast of object edges and boundaries is also poorly developed (Stephens & Banks, 1987). As this image illustrates, even by age 3 months, the infant's world is still pretty fuzzy.



Jordan Reeder/Jupiterimages



Newborn Reflexes When this 2-week-old baby (*left*) is held upright with her feet touching a flat surface, she displays the *stepping reflex*, moving her legs as if trying to walk. Another reflex that is present at birth is the *grasping reflex* (*right*). The infant's grip is so strong that he can support his own weight. Thought to enhance the newborn's chances for survival, these reflexive responses drop out during the first few months of life as the baby develops voluntary control over movements.

Picture Partner/Alamy

And, newborns quickly learn to differentiate between their mothers and strangers. Within just hours of their birth, newborns display a preference for their mother's voice and face over that of a stranger (Bushnell, 2001). For their part, mothers become keenly attuned to their infant's appearance, smell, and even skin texture. Fathers, too, are able to identify their newborn from a photograph after just minutes of exposure (Bader & Phillips, 2002).

Vision is the least developed sense at birth. A newborn infant is extremely nearsighted, meaning she can see close objects more clearly than distant objects. The optimal viewing distance for the newborn is about 6 to 12 inches, the perfect distance for a nursing baby to focus easily on her mother's face and make eye contact. Nevertheless, the infant's view of the world is pretty fuzzy for the first several months, even for objects that are within close range.

The interaction between adults and infants seems to compensate naturally for the newborn's poor vision. When adults interact with very young infants, they almost always position themselves so that their face is about 8 to 12 inches away from the baby's face. Adults also have a strong natural tendency to exaggerate head movements and facial expressions, such as smiles and frowns, again making it easier for the baby to see them.

Physical Development

By the time infants begin crawling, at about 7 to 8 months of age, their view of the world, including distant objects, will be as clear as that of their parents. The increasing maturation of the infant's visual system reflects the development of her brain. At birth, her brain is an impressive 25 percent of its adult weight. In contrast, her birth weight is only about 5 percent of her eventual adult weight. During infancy, her brain will grow to about 75 percent of its adult weight, while her body weight will reach only about 20 percent of her adult weight.

During the prenatal period, the top of the body develops faster than the bottom. For example, the head develops before the legs. If you've ever watched a 6-week old baby struggling to lift her head up, or a 3-month old baby pulling herself along the floor by her arms, you've probably noticed that an infant's motor skills also develop unevenly, and follow the same general pattern. The word *cephalocaudal* literally means "head to tail," and the term *cephalocaudal pattern* refers to the fact that physical and motor skill development tends to follow a "top to bottom" sequence.The infant develops control over her head, chest, and arms before developing control over the lower part of her body and legs (Kopp, 2011).

temperament Inborn predispositions to consistently behave and react in a certain way.

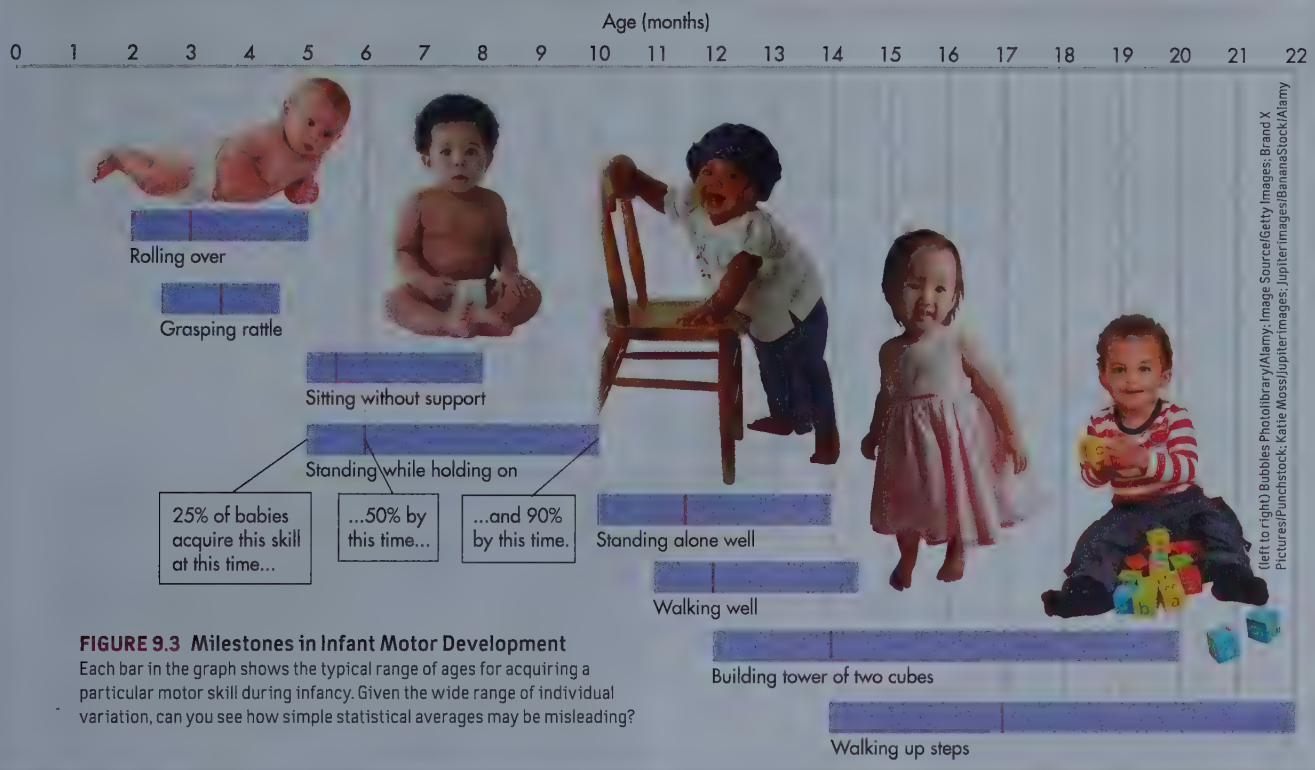


FIGURE 9.3 Milestones in Infant Motor Development
Each bar in the graph shows the typical range of ages for acquiring a particular motor skill during infancy. Given the wide range of individual variation, can you see how simple statistical averages may be misleading?

A second pattern is the *proximodistal trend,* which refers to the tendency of infants to develop motor control from the center of their bodies outwards. Babies gain control over their abdomen before they gain control over their elbows, knees, hands, or feet.

The basic *sequence* of motor skill development is universal, but the *average ages* can be a little deceptive (see Figure 9.3). As any parent knows, infants vary a great deal in the ages at which they master each skill. For example, virtually all infants are walking well by 15 months of age, but some infants will walk as early as 10 months. Each infant has her own timetable of physical maturation and developmental readiness to master different motor skills.

Social and Personality Development

From birth, forming close social and emotional relationships with caregivers is essential to the infant's physical and psychological well-being. Although physically helpless, the young infant does not play a passive role in forming these relationships. As you'll see in this section, the infant's individual traits play an important role in the development of the relationship between infant and caregiver.

Temperamental Qualities: Babies Are Different!

Infants come into the world with very distinct and consistent behavioral styles. Some babies are consistently calm and easy to soothe. Other babies are fussy, irritable, and hard to comfort. Some babies are active and outgoing; others seem shy and wary of new experiences. Psychologists refer to these inborn predispositions to consistently behave and react in a certain way as an infant's **temperament.**



Temperamental Patterns Most babies can be categorized into one of three broad temperamental patterns. An "easy" baby is usually easy to soothe, calm, cheerful, and readily adapts to new situations. "Slow-to-warm-up" babies tend to adapt to new situations and experiences very slowly, but once they adapt, they're fine. "Difficult" babies are more likely to be emotional, irritable, and fussy. Which category do you think the baby shown here might fit? Why?

ImageSource/agefotostock

CULTURE AND HUMAN BEHAVIOR

Where Does the Baby Sleep?

In most U.S. families, infants sleep in their own beds (Mindell & others, 2010a). It may surprise you to discover that the United States is very unusual in this respect. In one survey of 100 societies, the United States was the *only one* in which babies slept in separate rooms. Another survey of 136 societies found that in two-thirds of the societies, infants slept in the same beds as their mothers. In the remainder, infants generally slept in the same room as their mothers (Morelli & others, 1992).

In one of the few in-depth studies of co-sleeping in different cultures, Gilda Morelli and her colleagues (1992) compared the sleeping arrangements of several middle-class U.S. families with those of Mayan families in a small town in Guatemala. They found that babies in the Mayan families slept with their mothers until they were 2 or 3, usually until another baby was about to be born. At that point, toddlers moved to the bed of another family member, usually the father or an older sibling. Children continued to sleep with other family members throughout childhood.

Mayan mothers were shocked when the American researchers told them that infants in the United States slept alone and often in a different room from their parents. They believed that the practice was cruel and unnatural, and would have negative effects on the infant's development.

When infants and toddlers sleep alone, bedtime marks a separation from their families. To ease the child's transition to sleeping, "putting the baby to bed" often involves lengthy bedtime rituals, including rocking, singing lullabies, or reading stories (Morrell & Steele, 2003). Small children take comforting items, such as a favorite blanket or teddy bear, to bed with them to ease the stressful transition to falling asleep alone. The child may also use his "security blanket" or "cuddly" to comfort himself when he wakes up in the night, as most small children do.

In contrast, the Mayan babies did not take cuddly items to bed, and no special routines marked the transition between wakefulness and sleep. Mayan parents were puzzled by the very idea. Instead, the Mayan babies simply went to bed when their parents did or fell asleep in the middle of the family's social activities.

Morelli and her colleagues (1992) found that the different sleeping customs of the American and Mayan families reflect different cultural values. Some of the American babies slept in the same room as their parents when they were first born, which the parents felt helped foster feelings of closeness and emotional security in the newborns. Nonetheless, most of the American parents moved their babies to a separate room when they felt that the babies were ready to sleep alone, usually by the time they were 3 to 6 months of age. These parents explained their decision by saying that it was time for the baby to learn to be "independent" and "self-reliant."

In contrast, the Mayan parents felt that it was important to develop and encourage the infant's feelings of *interdependence* with other members of the family. Thus, in both Mayan and U.S. families, sleeping arrangements reflect cultural goals for child rearing and cultural values for relations among family members.



Maria Stenzel/NGS

Culture and Co-Sleeping Throughout the world, cultural and ethnic differences influence family decisions about sleeping arrangements for infants and young children (Li & others, 2008; Worthman & Brown, 2007). Among the indigenous Nenets people of Siberia, shown above, *co-sleeping* or *shared sleeping* is common, at least partly for the pragmatic reason of staying warm. Even in the United States, sleeping arrangements vary by racial and ethnic groups. Stephanie Milan and her colleagues (2007) found that Latino and African American preschoolers were more likely to sleep with a sibling or parent than were white preschoolers.

Interest in infant temperament was triggered by a classic longitudinal study launched in the 1950s by psychiatrists Alexander Thomas and Stella Chess. The focus of the study was on how temperamental qualities influence adjustment throughout life. Chess and Thomas rated young infants on a variety of characteristics, such as activity level, mood, regularity in sleeping and eating, and attention span. They found that about two-thirds of the babies could be classified into one of three broad temperamental patterns: *easy, difficult,* and *slow-to-warm-up*. The remaining third of the infants were characterized as *average* babies because they did not fit neatly into one of these three categories (Thomas & Chess, 1977).

Easy babies readily adapt to new experiences, generally display positive moods and emotions, and have regular sleeping and eating patterns. *Difficult* babies tend to be intensely emotional, are irritable and fussy, and cry a lot. They also tend to have irregular sleeping and eating patterns. *Slow-to-warm-up* babies have a low activity level, withdraw from new situations and people, and adapt to new experiences very gradually. After studying the same children from infancy through childhood, Thomas and Chess (1986) found that these broad patterns of temperamental qualities are remarkably stable.

Other temperamental patterns have been identified. For example, after decades of research, Jerome Kagan (2004, 2010) classified temperament in terms of *reactivity*. *High-reactive* infants react intensely to new experiences, strangers, and novel objects. They tend to be tense, fearful, and inhibited. At the opposite pole are *low-reactive* infants, who tend to be calmer, uninhibited, and bolder. Sociable rather than shy, low-reactive infants are more likely to show interest than fear when exposed to new people, experiences, and objects.

Virtually all temperament researchers agree that individual differences in temperament have a genetic and biological basis (Gagne & others, 2009). However, researchers also agree that environmental experiences can modify a child's basic temperament (Stack & others, 2010). As Kagan (2004) points out, "Temperament is not destiny. Many experiences will affect high and low reactive infants as they grow up. Parents who encourage a more sociable, bold persona and discourage timidity will help their high reactive children develop a less-inhibited profile."

Because cultural attitudes affect child-rearing practices, infant temperament can also be affected by cultural beliefs (Kagan, 2010). For example, cross-cultural studies of temperament have found that infants in the United States generally displayed more positive emotion than Russian or Asian infants (Molitor & Hsu, 2011). Why? U.S. parents tend to value and encourage expressions of positive emotions, such as smiling and laughing, in their babies. In contrast, parents in other cultures, including those of Russia and many Asian countries, place less emphasis on the importance of positive emotional expression. Thus, the development of temperamental qualities is yet another example of the complex interaction among genetic and environmental factors.

Attachment: Forming Emotional Bonds

attachment The emotional bond that forms between an infant and caregiver(s), especially his or her parents.

The emotional bond that forms between the infant and her caregivers, especially her parents, during the first year of life is called **attachment.** As conceptualized by attachment theorist John Bowlby (1969, 1988) and psychologist **Mary D. Salter Ainsworth** (1979), attachment relationships serve important functions throughout infancy and, indeed, the lifespan. Ideally, the parent or caregiver functions as a *secure base* for the infant, providing a sense of comfort and security—a safe haven from which the infant can explore and learn about the environment. According to attachment theory, an infant's ability to thrive physically and psychologically depends in large part on the quality of attachment (Ainsworth & others, 1978).

Generally, when parents are consistently warm, responsive, and sensitive to their infant's needs, the infant develops a *secure attachment* to her parents (Belsky, 2006). The infant's expectation that her needs will be met by her caregivers is the most essential ingredient in forming a secure attachment to them. And, studies have confirmed that sensitivity to the infant's needs is associated with secure attachment across diverse cultures (van Ijzendoorn & Sagi-Schwartz, 2008; Vaughn & others, 2007).

In contrast, *insecure attachment* may develop when an infant's parents are neglectful, inconsistent, or insensitive to his moods or behaviors. Insecure attachment seems to reflect an ambivalent or detached emotional relationship between an infant and his parents (Ainsworth, 1979; Isabella & others, 1989).

How do researchers measure attachment? The most commonly used procedure, called the *Strange Situation,* was devised by Ainsworth. The Strange Situation is typically used with infants who are between 1 and 2 years old (Ainsworth & others, 1978). In this technique, the baby and his mother are brought into an unfamiliar room with a variety of toys. A few minutes later, a stranger enters the room. The mother stays with the baby for a few moments, then departs, leaving the baby alone with the stranger. After a few minutes, the mother returns, spends a few minutes in the room, leaves, and returns again. Through a one-way window, observers record the infant's behavior throughout this sequence of separations and reunions.

Psychologists assess attachment by observing the child's behavior toward his mother during the Strange Situation procedure. When his mother is present, the *securely attached* baby will use her as a "secure base" from which to explore the new environment,



Robert Marvin

Mary D. Salter Ainsworth (1913–1999) Best known for developing the *Strange Situation* procedure to measure attachment, Mary D. Salter Ainsworth originated the concept of the *secure base*. She was also the first researcher in the United States to make extensive, systematic, naturalistic observations of mother–infant interactions in their own homes. Her findings often surprised contemporary psychologists. For example, Ainsworth provided the first evidence demonstrating the importance of the caregiver's responsiveness to the infant's needs (Bretherton & Main, 2000).



The Importance of Attachment Secure attachment in infancy forms the basis for emotional bonds in later childhood. At one time, attachment researchers focused only on the relationship between mothers and infants. Today, the importance of the attachment relationship between fathers and children is also recognized (Lucassen & others, in press).

Mango Productions/Corbis

periodically returning to her side. He will show distress when his mother leaves the room and will greet her warmly when she returns. A securely attached baby is easily soothed by his mother (Ainsworth & others, 1978; Lamb & others, 1985).

In contrast, an *insecurely attached* infant is less likely to explore the environment, even when her mother is present. In the Strange Situation, insecurely attached infants may appear either very anxious or completely indifferent. Such infants tend to ignore or avoid their mothers when they are present. Some insecurely attached infants become extremely distressed when their mothers leave the room. When insecurely attached infants are reunited with their mothers, they are hard to soothe and may resist their mothers' attempts to comfort them.

In studying attachment, psychologists have typically focused on the infant's bond with the mother, since the mother is often the infant's primary caregiver. Still, it's important to note that most fathers are also directly involved with the basic care of their infants and children. In homes where both parents are present, children who are attached to one parent are usually also attached to the other (Furman & Simon, 2004). Finally, infants are capable of forming attachments to other consistent caregivers in their lives, such as relatives or workers at a day-care center. Thus, an infant can form *multiple* attachments.

The quality of attachment during infancy is associated with a variety of long-term effects (Carlson & others, 2004; Malekpour, 2007). Preschoolers with a history of being securely attached tend to be more prosocial, empathic, and socially competent than are preschoolers with a history of insecure attachment (Rydell & others, 2005). In middle childhood, children with a history of secure attachment in infancy are better adjusted and have higher levels of social and cognitive development than do children who were insecurely attached in infancy (Kerns & others, 2007; Kerns & Richardson, 2005; Stams & others, 2002). Adolescents who were securely attached in infancy have fewer problems, do better in school, and have more successful relationships with their peers than do adolescents who were insecurely attached in infancy (Laible, 2007; Sroufe, 2002; Sweeney, 2007).

Because attachment in infancy seems to be so important, psychologists have extensively investigated the impact of day care on attachment. Later in the chapter, we'll take a close look at this issue (see p. 396).

Language Development

Probably no other accomplishment in early life is as astounding as language development. By the time a child reaches 3 years of age, he will have learned thousands of words and the complex rules of his language.

According to linguist Noam Chomsky (1965), every child is born with a biological predisposition to learn language—*any* language. In effect, children possess a "universal grammar"—a basic understanding of the common principles of language organization. Infants are innately equipped not only to understand language but also to extract grammatical rules from what they hear. The key task in the development of language is to learn a set of grammatical rules that allows the child to produce an unlimited number of sentences from a limited number of words.

At birth, infants can distinguish among the speech sounds of all the world's languages, no matter what language is spoken in their homes (Kuhl, 2004; Werker & Desjardins, 1995). Infants lose this ability by 10–12 months of age. Instead, they can distinguish only among the speech sounds that are present in the language to which they have been exposed (Kuhl & others, 1992; Yoshida & others, 2010). Thus, during the first year of life, infants begin to master the sound structure of their own native language.

Encouraging Language Development

Just as infants seem to be biologically programmed to learn language, parents seem to be biologically programmed to encourage language development by the way they speak to infants and toddlers. People in every culture, especially parents, use a style

of speech called *motherese, parentese,* or *infant-directed speech,* with babies (Bryant & Barrett, 2007; Kuhl, 2004).

Infant-directed speech is characterized by very distinct pronunciation, a simplified vocabulary, short sentences, high pitch, and exaggerated intonation and expression. Content is restricted to topics that are familiar to the child, and "baby talk" is often used—simplified words such as "go bye-bye" and "night-night." Often, questions are asked, encouraging a response from the infant (Fernald, 1992).

The adult use of infant-directed speech seems to be instinctive. Deaf mothers who use sign language modify their hand gestures when they communicate with infants and toddlers in a way that is very similar to the infant-directed speech of hearing mothers (Koester & Lahti-Harper, 2010).

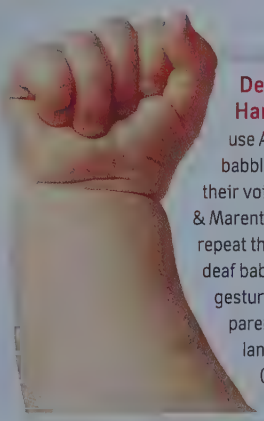
And, infants seem to prefer infant-directed speech to a more adult conversational style. The positive response from the young child makes adults more likely to use parentese (Fernald, 1985; Smith & Trainor, 2008). As infants mature, the speech patterns of parents change to fit the child's developing language abilities (McRoberts & others, 2009).

The Cooing and Babbling Stage of Language Development

As with many other aspects of development, the stages of language development appear to be universal (Kuhl, 2004). In virtually every culture, infants follow the same sequence of language development and at roughly similar ages (see Figure 9.4).

At about 3 months of age, infants begin to "coo," repeating vowel sounds such as *ahhhhh* or *ooooo,* varying the pitch up or down. At about 5 months of age, infants begin to *babble.* They add consonants to the vowels and string the sounds together in sometimes long-winded productions of babbling, such as *ba-ba-ba-ba, de-de-de-de,* or *ma-ma-ma-ma.*

When infants babble, they are not simply imitating adult speech. Infants all over the world use the *same* sounds when they babble, including sounds that do not occur in the language of their parents and other caregivers.



Deaf Babies Babble with Their Hands Deaf babies whose parents use American Sign Language (ASL) babble with their hands, rather than their voices (Petitto & others, 2001; Petitto & Marentette, 1991). Just as hearing babies repeat the same syllables over and over, deaf babies repeat the same simple hand gestures. Hearing babies born to deaf parents who are exposed only to sign language also babble with their hands (Petitto & others, 2004). Here, a baby repeats the sign for "A."

Romilly Lockyer/The Image Bank

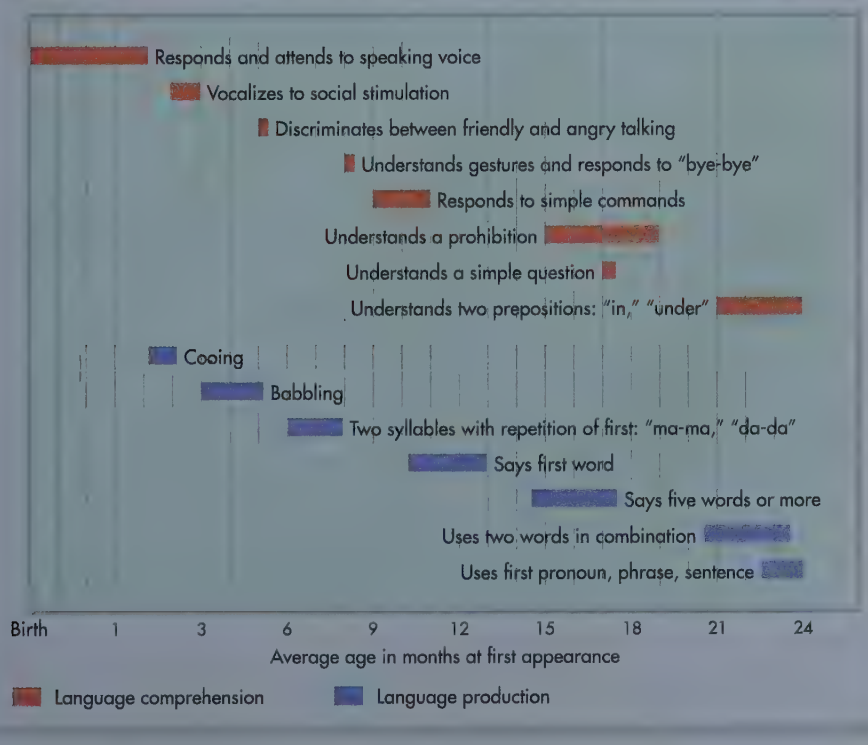


FIGURE 9.4 Milestones in Language Comprehension and Production
Approximate average age ranges for the first appearance of different stages of language development are shown here. Notice that language comprehension occurs much earlier than language production.

Source: Based on Bornstein & Lamb (1992).

SCIENCE VERSUS PSEUDOSCIENCE

Can a DVD Program Your Baby to Be a Genius?

It's a marketing phenomenon: videos developed specifically for infants and very young toddlers, with catchy titles like *Smart Baby, Brainy Baby,* and *Baby Einstein.* When the first *Baby Einstein* video was released in 1997, ads claimed that it promoted infant brain development (Bronson & Merryman, 2009).

Although the makers of *Baby Einstein* no longer feature such explicit claims in their advertising, most companies that market baby media either imply or state outright that their products are educational and will help infants learn (Wartella & others, 2010). No doubt fueled by the hope that viewing such media would benefit their babies, parents spend hundreds of millions of dollars annually on baby video products in the United States alone (DeLoache & others, 2010; Rideout, 2007).

But how effective are such videos? Do infants learn from watching them? Let's look at the evidence.

The first surprise came from a large study that showed that viewing baby media was actually *negatively correlated* with vocabulary growth in infants. Developmental psychologist Robert Zimmerman and his colleagues (2007) found that babies who *never* watched "educational" videos knew more words than babies who did. In fact, the more time infants spent watching baby media, the fewer words they knew.

Interestingly, the deficit in language skills was associated *only* with watching media designed for infant learning—and not other types of television or video. Baby media, the researchers pointed out, have short scenes, anonymous voice-overs rather than talking characters, and visually engaging but disconnected images. In contrast, shows like *Sesame Street,* which feature recognizable characters and a rich narrative context, *have* been shown to have educational benefit (Richert & others, 2011; Zimmerman & others, 2007).

One potential drawback of this study was that it was *correlational* and relied heavily on parent surveys. So, developmental psychologist Judy DeLoache and her colleagues (2010) designed a rigorously controlled experiment in which the infants would be objectively tested for their knowledge of the specific words that were taught on a popular video.



Ruby Washington/The New York Times

Encouraging Language Development Research shows that one of the most effective ways to enhance a child's cognitive development is to read to her—even in infancy (Robb & others, 2009). Rather than spending money on expensive videos, buy books or check them out from your local library.

Twelve- to 18-month-old infants were randomly assigned to four groups:

- In the *video-with-no-interaction* condition, the children watched the DVD alone at least five times a week over a 4-week period.
- In the *video-with-interaction* condition, the child watched the DVD with a parent for the same amount of time.
- In the *parent-teaching condition,* the children had no exposure to the video at all. Instead, the parents were given a list of the 25 common words featured on the video and were instructed to "try to teach your child as many of these words as you can in whatever way seems natural to you."

At around 9 months of age, babies begin to babble more in the sounds specific to their language. Babbling, then, seems to be a biologically programmed stage of language development (Gentilucci & Dalla Volta, 2007; Petitto & others, 2004).

The One-Word Stage of Language Development

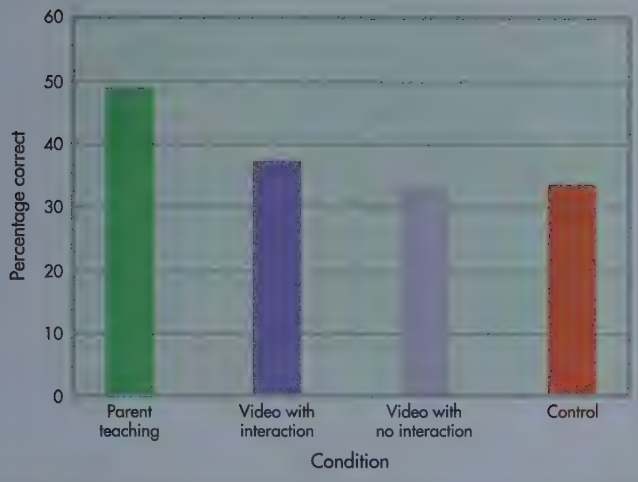
Long before babies become accomplished talkers, they understand much of what is said to them. Before they are a year old, most infants can understand simple commands, such as "Bring Daddy the block," even though they cannot *say* the words *bring, Daddy,* or *block.* This reflects the fact that an infant's **comprehension vocabulary** (the words she understands) is much larger than her **production vocabulary** (the words she can say). Generally, infants acquire comprehension of words more than twice as fast as they learn to speak new words.

Somewhere around their first birthday, infants produce their first real words. First words usually refer to concrete objects or people that are important to the child, such as *mama, daddy,* or *ba-ba* (bottle). First words are also often made up of the syllables that were used in babbling.

During the *one-word stage,* babies use a single word and vocal intonation to stand for an entire sentence. With the proper intonation and context, *baba* can mean "I want my bottle!" "There's my bottle!" or "Where's my bottle?"

comprehension vocabulary The words that are understood by an infant or child.

production vocabulary The words that an infant or child understands and can speak.



What Do Infants Learn from Baby Videos? Apparently, not much. After four weeks of viewing a bestselling video featuring common words and household objects, babies hadn't learned any more words than infants who had never watched the video. As the researchers conclude, "Significantly more learning occurred in the context of everyday parent-child interactions than in front of television screens."

- Finally, in the *control condition*, the children were not exposed to the video and the parents were not instructed to try to teach them the words. Instead, they were simply tested for their word knowledge before and after the 4-week period.

Why was including a control condition so important? Put simply, because children naturally learn a lot of words during this period of development. Thus, the control condition provided a benchmark of normal vocabulary growth against which the experimental groups could be compared.

What were the results? As shown in the graph, babies learned the most words from interacting with their parents. In contrast, despite extensive exposure to a video designed to teach them specific words, infants in the video groups did not learn any more new words than did children with no exposure to the video at all.

Was it because the infants found the videos boring, or didn't pay attention to them? No. Parents reported that their babies were mesmerized by the program. However, in an interesting twist, DeLoache and her colleagues (2010) found that there was no correlation between how much the parents thought their child learned from the video and how much their child had actually learned. However, the more *parents* liked the video, the more they thought their child had learned from it.

This finding may help explain the many enthusiastic testimonials in marketing materials for baby media. Even though there was no difference in how many words were learned, parents who had a favorable attitude toward the video thought that their children had learned more because of viewing it. One possible explanation is illusory correlation: Parents may misattribute normal developmental progress to the child's exposure to the video.

Since the research on baby media began to be published, some companies, like the producers of *Baby Einstein*, have revised their marketing materials to emphasize the "engaging" nature of the media rather than its "educational" nature. The research is clear: Interacting with a parent or other caregiver is by far the most effective way to increase an infant's cognitive and, especially, language skills.

The bottom line: Save your money and talk to your baby. Better yet, read to him! Several studies have found that the best predictor of infant language is the amount of time that parents spend reading to their children (Robb & others, 2009).

The Two-Word Stage of Language Development

Around their second birthday, toddlers begin putting words together. During the *two-word stage*, they combine two words to construct a simple "sentence," such as "Mama go," "Where kitty?" and "No potty!" During this stage, the words used are primarily content words—nouns, verbs, and sometimes adjectives or adverbs. Articles (*a, an, the*) and prepositions (such as *in, under, on*) are omitted. Two-word sentences reflect the first understandings of grammar. Although these utterances include only the most essential words, they basically follow a grammatically correct sequence.

At around 2½ years of age, children move beyond the two-word stage. They rapidly increase the length and grammatical complexity of their sentences. There is a dramatic increase in the number of words they can comprehend and produce. By the age of 3, the typical child has a production vocabulary of more than 3,000 words. Acquiring about a dozen new words per day, a child may have a production vocabulary of more than 10,000 words by school age (Bjorklund, 1995).

Many new parents, eager to accelerate their young children's language and cognitive development, purchase DVDs or videos that claim to educate as well as entertain the growing child. But what do babies learn from baby videos? We take a critical look at this question in the Science Versus Pseudoscience box: Can a DVD Program Your Baby to Be a Genius?

CONCEPT REVIEW 9.1

Early Development

Indicate whether each of the following statements is true or false. If a statement is false, write in the correct statement.

_____ 1. Each chromosome has exactly 23 genes.

_____ 2. Different types of body cells develop because they have a different combination of genes in their cell nucleus.

_____ 3. The greatest vulnerability to teratogens usually occurs during the embryonic stage.

_____ 4. At birth, the brain is fully developed and no longer has the capacity to generate new neurons or dendrites.

_____ 5. Vision is the least well-developed sense in the human newborn.

_____ 6. Sam, who is 4 years old, adapts easily to new situations. Sam would probably be classified as "slow-to-warm-up" in temperament.

_____ 7. Instead of happily exploring the toys in the doctor's waiting room, Amy clings to her mother's hand, a behavior that characterizes an insecurely attached toddler.

_____ 8. Infants babble using only the sounds that they hear in their home environment.

Cognitive Development

KEY THEME

› According to Piaget's theory, children progress through four distinct cognitive stages, and each stage marks a shift in how they think and understand the world.

KEY QUESTIONS

› What are Piaget's four stages of cognitive development?

› What are three criticisms of Piaget's theory?

› How do Vygotsky's ideas about cognitive development differ from Piaget's theory?

Just as children advance in motor skill and language development, they also develop increasing sophistication in cognitive processes—thinking, remembering, and processing information. The most influential theory of cognitive development is that of Swiss psychologist **Jean Piaget.** Originally trained as a biologist, Piaget (1961) combined a boundless curiosity about the nature of the human mind with a gift for scientific observation (Boeree, 2006).



Bill Anderson/Photo Researchers;

Jean Piaget Swiss psychologist Jean Piaget (1896–1980) viewed the child as a little scientist, actively exploring his or her world. Much of Piaget's theory was based on his careful observation of individual children, especially his own children.

Piaget (1952, 1972) believed that children *actively* try to make sense of their environment rather than passively soaking up information about the world. To Piaget, many of the "cute" things children say actually reflect their sincere attempts to make sense of their world. In fact, Piaget carefully observed his own three children in developing his theory and published three books about them (Boeree, 2006).

According to Piaget, children progress through four distinct cognitive stages: the *sensorimotor stage,* from birth to age 2; the *preoperational stage,* from age 2 to age 7; the *concrete operational stage,* from age 7 to age 11; and the *formal operational stage,* which begins during adolescence and continues into adulthood. As a child advances to a new stage, his thinking is *qualitatively different* from that of the previous stage. In other words, each new stage represents a fundamental shift in *how* the child thinks and understands the world.

Piaget saw this progression of cognitive development as a continuous, gradual process. As a child develops and matures, she does not simply acquire more information.

Rather, she develops a new understanding of the world in each progressive stage, building on the understandings acquired in the previous stage (Piaget, 1961). As the child *assimilates* new information and experiences, he eventually changes his way of thinking to *accommodate* new knowledge (Piaget, 1961).

Piaget (1971) believed that these stages were biologically programmed to unfold at their respective ages. He also believed that children in every culture progressed through the same sequence of stages at roughly similar ages. However, Piaget also recognized that hereditary and environmental differences could influence the rate at which a given child progressed through the stages.

For example, a "bright" child may progress through the stages faster than a child who is less intellectually capable. A child whose environment provides ample and varied opportunities for exploration is likely to progress faster than a child who has limited environmental opportunities. Thus, even though the sequence of stages is universal, there can be individual variation in the rate of cognitive development.

When Laura was almost 3, Sandy and Laura were investigating the tadpoles in the creek behind our home. "Do you know what tadpoles become when they grow up? They become frogs," Sandy explained. Laura looked very serious. After considering this new bit of information for a few moments, she asked, "Laura grow up to be a frog, too?"

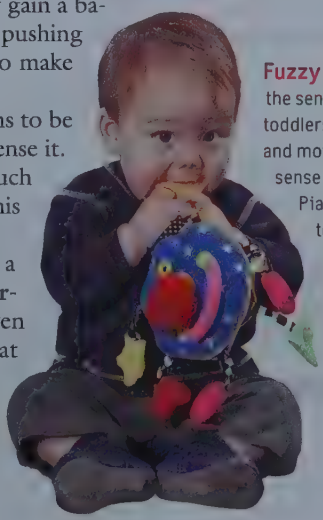
The Sensorimotor Stage

The **sensorimotor stage** extends from birth until about 2 years of age. During this stage, infants acquire knowledge about the world through actions that allow them to directly experience and manipulate objects. Infants discover a wealth of very practical sensory knowledge, such as what objects look like and how they taste, feel, smell, and sound.

Infants in this stage also expand their practical knowledge about motor actions—reaching, grasping, pushing, pulling, and pouring. In the process, they gain a basic understanding of the effects their own actions can produce, such as pushing a button to turn on the television or knocking over a pile of blocks to make them crash and tumble.

At the beginning of the sensorimotor stage, the infant's motto seems to be "Out of sight, out of mind." An object exists only if she can directly sense it. For example, if a 4-month-old infant knocks a ball underneath the couch and it rolls out of sight, she will not look for it. Piaget interpreted this response to mean that to the infant, the ball no longer exists.

However, by the end of the sensorimotor stage, children acquire a new cognitive understanding, called object permanence. **Object permanence** is the understanding that an object continues to exist even if it can't be seen. Now the infant will actively search for a ball that she has watched roll out of sight (Mash & others, 2006). Infants gradually acquire an understanding of object permanence as they gain experience with objects, as their memory abilities improve, and as they develop mental representations of the world, which Piaget called *schemas* (Perry & others, 2008).



Fuzzy Tastes Different! During the sensorimotor stage, infants and toddlers rely on their basic sensory and motor skills to explore and make sense of the world around them. Piaget believed that infants and toddlers acquire very practical understandings about the world as they touch, feel, taste, push, pull, twist, turn, and manipulate the objects they encounter.

David Young-Wolff/PhotoEdit Inc.

The Preoperational Stage

The **preoperational stage** lasts from roughly age 2 to age 7. In Piaget's theory, the word *operations* refers to logical mental activities. Thus, the "preoperational" stage is a prelogical stage.

The hallmark of preoperational thought is the child's capacity to engage in symbolic thought. **Symbolic thought** refers to the ability to use words, images, and symbols to represent the world. One indication of the expanding capacity for symbolic thought is the child's impressive gains in language during this stage.

The child's increasing capacity for symbolic thought is also apparent in her use of fantasy and imagination while playing. A discarded box becomes a spaceship, a house, or a fort as children imaginatively take on the roles of different characters. Some children even create an imaginary companion (Taylor & others, 2009).

Still, the preoperational child's understanding of symbols remains immature. A 2-year-old shown a picture of a flower, for example, may try to smell it. A young child may be puzzled by the notion that a map symbolizes an actual location—

sensorimotor stage In Piaget's theory, the first stage of cognitive development, from birth to about age 2; the period during which the infant explores the environment and acquires knowledge through sensing and manipulating objects.

object permanence The understanding that an object continues to exist even when it can no longer be seen.

preoperational stage In Piaget's theory, the second stage of cognitive development, which lasts from about age 2 to age 7; characterized by increasing use of symbols and prelogical thought processes.

symbolic thought The ability to use words, images, and symbols to represent the world.

Preoperational Thinking: Manipulating Mental Symbols With a hodgepodge of toys, a cardboard box, and some rope, these two are having great fun. The young child's increasing capacity for symbolic thought is delightfully reflected in symbolic play and deferred imitation. In *symbolic play*, one object stands for another: A box can become a house, a bus, a shopping cart, or a hot air balloon. *Deferred imitation* is the capacity to repeat an action observed earlier, such as the action of an explorer surveying the land.



DonSmith/Alamy

as in the cartoon below. In short, preoperational children are still actively figuring out the relationship between symbols and the actual objects they represent.

The thinking of preoperational children often displays **egocentrism.** By *egocentrism,* Piaget did not mean selfishness or conceit. Rather, egocentric children lack the ability to consider events from another person's point of view. Thus, the young child genuinely thinks that Grandma would like a new Lego set or video game for her upcoming birthday because that's what *he* wants. Egocentric thought is also operating when the child silently nods his head in answer to Grandpa's question on the telephone.

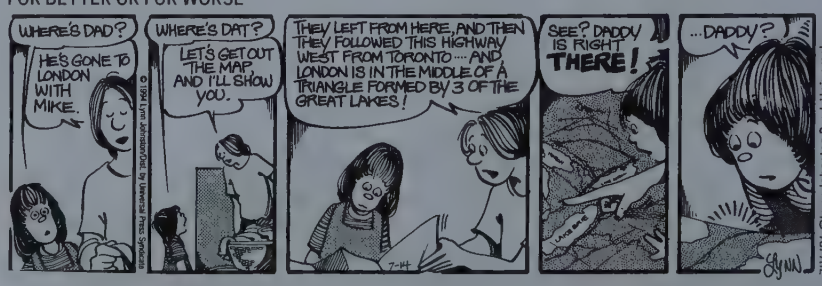
The preoperational child's thought is also characterized by irreversibility and centration. **Irreversibility** means that the child cannot mentally reverse a sequence of events or logical operations back to the starting point. For example, the child doesn't understand that adding "3 plus 1" and adding "1 plus 3" refer to the same logical operation. **Centration** refers to the tendency to focus, or center, on only one aspect of a situation, usually a perceptual aspect. In doing so, the child ignores other relevant aspects of the situation.

The classic demonstration of both irreversibility and centration involves a task devised by Piaget. When our daughter Laura was 5, we tried this task with her. First, we showed her two identical glasses, each containing exactly the same amount of liquid. Laura easily recognized the two amounts of liquid as being the same.

Then, while Laura watched intently, we poured the liquid from one of the glasses into a third container that was much taller and narrower than the others. "Which container," we asked, "holds more liquid?" Like any other preoperational child, Laura answered confidently, "The taller one!" Even when we repeated the procedure,

- **egocentrism** In Piaget's theory, the inability to take another person's perspective or point of view.
- **irreversibility** In Piaget's theory, the inability to mentally reverse a sequence of events or logical operations.
- **centration** In Piaget's theory, the tendency to focus, or *center*, on only one aspect of a situation and ignore other important aspects of the situation.
- **conservation** In Piaget's theory, the understanding that two equal quantities remain equal even though the form or appearance is rearranged, as long as nothing is added or subtracted.
- **concrete operational stage** In Piaget's theory, the third stage of cognitive development, which lasts from about age 7 to adolescence; characterized by the ability to think logically about concrete objects and situations.
- **formal operational stage** In Piaget's theory, the fourth stage of cognitive development, which lasts from adolescence through adulthood; characterized by the ability to think logically about abstract principles and hypothetical situations.

FOR BETTER OR FOR WORSE



7/14/94 ©Lynn Johnston Prod. Universal Press Syndicate



Bill Armstrong

Piaget's Conservation Task Five-year-old Laura compares the liquid in the two short beakers, then watches as Sandy pours the liquid into a tall, narrow beaker. When asked which has more, Laura insists that there is more liquid in the tall beaker. As Piaget's classic task demonstrates, the average 5-year-old doesn't grasp this principle of conservation. Even though Laura repeated this demonstration several times for the photographer, she persisted in her belief that the tall beaker had more liquid. We tried the demonstration again when Laura was almost 7. Now in the concrete operational stage, Laura immediately understood that both beakers held the same amount of liquid—just as Piaget's theory predicts.

reversing the steps over and over again, Laura remained convinced that the taller container held more liquid than did the shorter container.

This classic demonstration illustrates the preoperational child's inability to understand conservation. The principle of **conservation** holds that two equal physical quantities remain equal even if the appearance of one is changed, as long as nothing is added or subtracted (Piaget & Inhelder, 1974). Because of *centration,* the child cannot simultaneously consider the height and the width of the liquid in the container. Instead, the child focuses on only one aspect of the situation, the height of the liquid. And because of *irreversibility,* the child cannot cognitively reverse the series of events, mentally returning the poured liquid to its original container. Thus, she fails to understand that the two amounts of liquid are still the same.

The Concrete Operational Stage

With the beginning of the **concrete operational stage,** at around age 7, children become capable of true logical thought. They are much less egocentric in their thinking, can reverse mental operations, and can focus simultaneously on two aspects of a problem. In short, they understand the principle of conservation. When presented with two rows of pennies, each row equally spaced, concrete operational children understand that the number of pennies in each row remains the same even when the spacing between the pennies in one row is increased.

As the name of this stage implies, thinking and use of logic tend to be limited to concrete reality—to tangible objects and events. Children in the concrete operational stage often have difficulty thinking logically about hypothetical situations or abstract ideas. For example, an 8-year-old will explain the concept of friendship in very tangible terms, such as "Friendship is when someone plays with me." In effect, the concrete operational child's ability to deal with abstract ideas and hypothetical situations is limited to his or her personal experiences and actual events.

From Concrete Operations to Formal Operations Logical thinking is evident during the concrete operational stage but develops more fully during the formal operational stage. At about the age of 12, the young person becomes capable of applying logical thinking to hypothetical situations and abstract concepts, such as the principles of molecular bonds in this chemistry class. But, as is true of each of Piaget's stages, new cognitive abilities emerge gradually. Having a tangible model to manipulate helps these students grasp abstract chemistry concepts.



Jon Feingersh/Jupiterimages

The Formal Operational Stage

At the beginning of adolescence, children enter the **formal operational stage.** In terms of problem solving, the formal operational adolescent is much more systematic and logical than the concrete operational child (Kuhn & Franklin, 2006). Formal operational thought reflects the ability to think logically even when dealing with abstract concepts or hypothetical situations (Kuhn, 2008; Piaget, 1972; Piaget & Inhelder, 1958). In contrast to the concrete operational child, the formal operational adolescent explains *friendship* by emphasizing more global and abstract characteristics, such as mutual trust, empathy, loyalty, consistency, and shared beliefs (Harter, 1990).

zone of proximal development In Vygotsky's theory of cognitive development, the difference between what children can accomplish on their own and what they can accomplish with the help of others who are more competent.

TABLE 9.2

Piaget's Stages of Cognitive Development

Stage	Characteristics of the Stage	Major Change of the Stage
Sensorimotor (0–2 years)	Acquires understanding of object permanence. First understandings of cause-and-effect relationships.	Development proceeds from reflexes to active use of sensory and motor skills to explore the environment.
Preoperational (2–7 years)	Symbolic thought emerges. Language development occurs (2–4 years). Thought and language both tend to be egocentric. Cannot solve conservation problems.	Development proceeds from understanding simple cause-and-effect relationships to prelogical thought processes involving the use of imagination and symbols to represent objects, actions, and situations.
Concrete operations (7–11 years)	Reversibility attained. Can solve conservation problems. Logical thought develops and is applied to concrete problems. Cannot solve complex verbal problems and hypothetical problems.	Development proceeds from prelogical thought to logical solutions to concrete problems.
Formal operations (adolescence through adulthood)	Logically solves all types of problems. Thinks scientifically. Solves complex verbal and hypothetical problems. Is able to think in abstract terms.	Development proceeds from logical solving of concrete problems to logical solving of all classes of problems, including abstract problems.

But, like the development of cognitive abilities during infancy and childhood, formal operational thought emerges only gradually. Formal operational thought continues to increase in sophistication throughout adolescence and adulthood. Although an adolescent may deal effectively with abstract ideas in one domain of knowledge, his thinking may not reflect the same degree of sophistication in other areas. Piaget (1973) acknowledged that even among many adults, formal operational thinking is often limited to areas in which they have developed expertise or a special interest.

Table 9.2 summarizes Piaget's stages of cognitive development.



Courtesy of Renee Baillargeon, University of Illinois at Urbana-Champaign

As researchers continue to make progress in understanding how infants attain and use their physical knowledge, we come closer to unveiling the complex architecture that makes it possible for them to learn, so very rapidly, about the world around them.

Renée Baillargeon

Criticisms of Piaget's Theory

Piaget's theory has inspired hundreds, if not thousands, of research studies, and he is considered one of the most important scientists of the twentieth century (Perret-Clermont & Barrelet, 2008). Generally, scientific research has supported Piaget's most fundamental idea: that infants, young children, and older children use distinctly different cognitive abilities to construct their understanding of the world. However, other aspects of Piaget's theory have been challenged.

Criticism 1: Piaget underestimated the cognitive abilities of infants and young children. To test for object permanence, Piaget would show an infant an object, cover it with a cloth, and then observe whether the infant tried to reach under the cloth for the object. Using this procedure, Piaget found that it wasn't until an infant was about 9 months old that she behaved as if the object continued to exist after it was hidden.

But what if the infant "knew" that the object was under the cloth but simply lacked the physical coordination to reach for it? How could you test this hypothesis? Rather than using manual tasks to assess object permanence and other cognitive abilities, **Renée Baillargeon** developed a method based on *visual* tasks. Baillargeon's research is based on the premise that infants, like adults, will look longer at "surprising" events that appear to contradict their understanding of the world.

In this research paradigm, the infant first watches an *expected event,* which is consistent with the understanding that is being tested. Then, the infant is shown

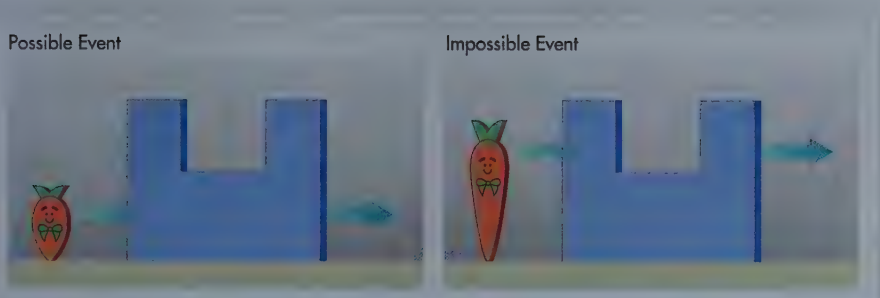


FIGURE 9.5 Testing Object Permanence in Babies How can you test object permanence in infants who are too young to reach for a hidden object? Three-and-a-half-month-old infants initially watched a possible event: The short carrot passes from one side of the panel to the other without appearing in the window. In the impossible event, the tall carrot does the same. Because the infants are surprised and look longer at the impossible event, Baillargeon and DeVos (1991) concluded that the infants had formed a mental representation of the existence, height, and path of each carrot as it moved behind the panel—the essence of object permanence (Baillargeon, 2004).

an *unexpected event*. If the unexpected event violates the infant's understanding of physical principles, he should be surprised and look longer at the unexpected event than the expected event.

Figure 9.5 shows one of Baillargeon's classic tests of object permanence, conducted with Julie DeVos (Baillargeon & DeVos, 1991). If the infant understands that objects continue to exist even when they are hidden, she will be surprised when the tall carrot unexpectedly does *not* appear in the window of the panel.

Using variations of this basic experimental procedure, Baillargeon and her colleagues have shown that infants as young as 2½ months of age display object permanence (Baillargeon & others, 2009; Luo & others, 2009). This is more than six months earlier than the age at which Piaget believed infants first showed evidence of object permanence.

Piaget's discoveries laid the groundwork for our understanding of cognitive development. However, as developmental psychologists Jeanne Shinskey and Yuko Munakata (2005) observe, today's researchers recognize that "what infants appear to know depends heavily on how they are tested."

Criticism 2: Piaget underestimated the impact of the social and cultural environment on cognitive development. In contrast to Piaget, the Russian psychologist **Lev Vygotsky** believed that cognitive development is strongly influenced by social and cultural factors. Vygotsky formulated his theory of cognitive development at about the same time as Piaget formulated his. However, Vygotsky's writings did not become available in the West until many years after his untimely death from tuberculosis in 1934 (Rowe & Wertsch, 2002; van Geert, 1998).

Vygotsky agreed with Piaget that children may be able to reach a particular cognitive level through their own efforts. However, Vygotsky (1978, 1987) argued that children are able to attain higher levels of cognitive development through the support and instruction that they receive from other people. Researchers have confirmed that social interactions, especially with older children and adults, play a significant role in a child's cognitive development (Psaltis & others, 2009; Wertsch, 2008).

One of Vygotsky's important ideas was his notion of the **zone of proximal development.** This refers to the gap between what children can accomplish on their own and what they can accomplish with the help of others who are more competent (Holzman, 2009). Note that the word *proximal* means "nearby," indicating that the assistance provided goes just slightly beyond the child's current abilities. Such guidance can help "stretch" the child's cognitive abilities to new levels.

Cross-cultural studies have shown that cognitive development is strongly influenced by the skills that are valued and encouraged in a particular environment, such as the ability to weave, hunt, or collaborate with others (Greenfield, 2009; Wells, 2009). Such findings suggest that Piaget's stages are not as universal and culture-free as some researchers had once believed (Cole & Packer, 2011).

Criticism 3: Piaget overestimated the degree to which people achieve formal operational thought processes. Researchers have found that many adults display abstract-hypothetical thinking only in limited areas of knowledge, and that some adults never display formal operational thought processes at all (see Kuhn, 2008;



Lev Vygotsky Russian psychologist Lev Vygotsky was born in 1896, the same year as Piaget. He died in 1934 of tuberculosis. Recent decades have seen a resurgence of interest in Vygotsky's theoretical writings, which emphasized the impact of social and cultural factors on cognitive development. According to Vygotsky, cognitive development always takes place within a social and cultural context.

Sovfoto/Eastfoto

Molitor & Hsu, 2011). College students, for example, may not display formal operational thinking when given problems outside their major, as when an English major is presented with a physics problem (DeLisi & Staudt, 1980). Late in his life, Piaget (1972, 1973) suggested that formal operational thinking might not be a universal phenomenon, but instead is the product of an individual's expertise in a specific area.

Rather than distinct stages of cognitive development, some developmental psychologists emphasize the **information-processing model of cognitive development.** This model focuses on the development of fundamental mental processes, such as attention, memory, and problem solving (Munakata & others, 2006). In this approach, cognitive development is viewed as a process of continuous change over the lifespan (Courage & Howe, 2002; Craik & Bialystok, 2006). Through life experiences, we continue to acquire new knowledge, including more sophisticated cognitive skills and strategies. In turn, this improves our ability to process, learn, and remember information.

information-processing model of cognitive development The model that views cognitive development as a process that is continuous over the lifespan and that studies the development of basic mental processes such as attention, memory, and problem solving.

With the exceptions that have been noted, Piaget's observations of the changes in children's cognitive abilities are fundamentally accurate. His description of the distinct cognitive changes that occur during infancy and childhood ranks as one of the most outstanding contributions to developmental psychology.

CONCEPT REVIEW 9.2

Piaget's Stages of Cognitive Development

Indicate which stage of cognitive development is illustrated by each of the following examples. Choose from:

a. sensorimotor
b. preoperational
c. concrete operational
d. formal operational

_____ 1. When confronted with a lawn mower that will not start, Jason approaches the problem very systematically, checking and eliminating possible causes one at a time.

_____ 2. Lynn rolls identical amounts of clay into two balls and is quite sure they are exactly the same. However, when her dad flattens one ball into a pancake shape, Lynn is confident that the pancake has more clay than the ball.

_____ 3. When Carla's mother hides her favorite toy under a cushion, Carla starts playing with another toy and acts as though her favorite toy no longer exists.

_____ 4. Andrew is told that Michael is taller than Bridget and Bridget is taller than Patrick. When asked who is the shortest child, Andrew thinks carefully, and then answers, "Patrick."



Adolescence

KEY THEME

› Adolescence is the stage that marks the transition from childhood to adulthood.

KEY QUESTIONS

› What factors affect the timing of puberty?
› What characterizes adolescent relationships with parents and peers?
› What is Erikson's psychosocial theory of lifespan development?

Adolescence is the transitional stage between late childhood and the beginning of adulthood. Although it can vary by individual and gender, adolescence usually begins around age 11 or 12. It is a transition marked by sweeping physical, social, and cognitive changes as the individual moves toward independence and adult responsibilities. Outwardly, the most noticeable changes that occur during adolescence are the physical changes that accompany the development of sexual maturity. We'll begin by considering those changes, then turn to the aspects of social development during adolescence. Following that discussion, we'll consider some of the cognitive changes of adolescence, including identity formation.

adolescence The transitional stage between late childhood and the beginning of adulthood, during which sexual maturity is reached.

Physical and Sexual Development

Nature seems to have a warped sense of humor when it comes to **puberty,** the physical process of attaining sexual maturation and reproductive capacity that begins during the early adolescent years. As you may well remember, physical development during adolescence sometimes proceeds unevenly. Feet and hands get bigger before legs and arms do. The torso typically develops last, so shirts and blouses sometimes don't fit quite right. And the left and right sides of the body can grow at different rates. The resulting lopsided effect can be quite distressing: One ear, foot, testicle, or breast may be noticeably larger than the other. Thankfully, such asymmetries tend to even out by the end of adolescence.

Although nature's game plan for physical change during adolescence may seem haphazard, puberty actually tends to follow a predictable sequence for each sex. These changes are summarized in Table 9.3.

Primary and Secondary Sex Characteristics

The physical changes of puberty fall into two categories. Internally, puberty involves the development of the **primary sex characteristics,** which are the sex organs that are directly involved in reproduction. For example, the female's uterus and the male's testes enlarge in puberty. Externally, development of the **secondary sex characteristics,** which are not directly involved in reproduction, signals increasing sexual maturity. Secondary sex characteristics include changes in height, weight, and body shape; the appearance of body hair and voice changes; and, in girls, breast development.

As you can see in Table 9.3, females are typically about two years ahead of males in terms of physical and sexual maturation. For example, the period of marked acceleration in weight and height gains, called the **adolescent growth spurt,** occurs about two years earlier in females than in males. Much to the chagrin of many sixth- and seventh-grade boys, it's not uncommon for their female classmates to be both heavier and taller than they are.

The statistical averages in Table 9.3 are informative, but—because they are only averages—they cannot convey the normal range of individual variation in the timing of pubertal events (see Ellis, 2004). For example, a female's first menstrual period, termed **menarche,** typically occurs around age 12 or 13, but menarche may take place as early as age 9 or 10 or as late as age 16 or 17. For boys, the testicles typically begin enlarging around age 11 or 12, but the process can begin before age 9 or after age 14.



Dennis MacDonald/Photo Edit

Girls Get a Head Start These two eighth-graders are the same age! In terms of the progress of sexual and physical maturation, girls are usually about two years ahead of boys.

TABLE 9.3

The Typical Sequence of Puberty

Girls	Average Age	Boys	Average Age
Ovaries increase production of estrogen and progesterone	9	Testes increase production of testosterone	10
Internal sex organs begin to grow larger	9½	External sex organs begin to grow larger	11
Breast development begins	10	Production of sperm and first ejaculation	13
Peak height spurt	12	Peak height spurt	14
Peak muscle and organ growth, including widening of hips	12½	Peak muscle and organ growth, including broadening of shoulders	14½
Menarche (first menstrual period)	12½	Voice lowers	15
First ovulation (release of fertile egg)	13½	Facial hair appears	16

Source: Based on data in Brooks-Gunn & Reiter (1990).

- **puberty** The stage of adolescence in which an individual reaches sexual maturity and becomes physiologically capable of sexual reproduction.
- **primary sex characteristics** Sexual organs that are directly involved in reproduction, such as the uterus, ovaries, penis, and testicles.
- **secondary sex characteristics** Sexual characteristics that develop during puberty and are not directly involved in reproduction but differentiate between the sexes, such as male facial hair and female breast development.
- **adolescent growth spurt** The period of accelerated growth during puberty, involving rapid increases in height and weight.
- **menarche** (meh-NAR-kee) A female's first menstrual period, which occurs during puberty.

FOCUS ON NEUROSCIENCE

The Adolescent Brain: A Work in Progress

For many adolescents, the teenage years, especially the early ones, seem to seesaw between moments of exhilaration and exasperation. Impressive instances of insightful behavior are counterbalanced by impulsive decisions made with no consideration of the potential risks or consequences. How can erratic adolescent behavior be explained?

For many years, the unpredictable behavior and mood swings of adolescents were explained as being due to "raging hormones." However, researchers have actually found little connection between hormone levels and adolescent behavior. As researcher Ronald Dahl (2003) explains, "High levels of sex hormones are not the cause of emotional problems in adolescents. Many adolescents with peak hormone levels experience no emotional difficulties at all." Rather than raging reproductive hormones, the explanation may lie within the adolescent brain.

To track changes in the developing brain, neuroscientists Jay Giedd, Elizabeth Sowell, Paul Thompson, and their colleagues have used magnetic resonance imaging (MRI) since the early 1990s to repeatedly scan the brains of normal kids and teenagers. One striking insight produced by their studies is that the human brain goes through not one but two distinct spurts of brain development—one during prenatal development and one during late childhood just prior to puberty (Giedd, 2008; Gogtay & others, 2004; Lenroot & Giedd, 2006).

Earlier in the chapter, we described how new neurons are produced at an astonishing rate during the first several months of prenatal development—so much so that by the sixth month of prenatal development, there is a vast overabundance of neurons in the fetal brain.

During the final months of prenatal development, there is fierce competition among the neurons to make connections and survive. In the neuronal equivalent of "survival of the fittest," those neurons that don't make connections are eliminated. This process is called *pruning*. During the years of infancy and early childhood, the brain's outer gray matter continues to develop and grow. The tapestry of interconnections between neurons becomes much more intricate as dendrites and axon terminals multiply and branch to extend their reach. White matter also increases as groups of neurons develop *myelin*, the white, fatty covering that insulates some axons, speeding communication between neurons.

Outwardly, these brain changes are reflected in the increasing cognitive and physical capabilities of the child. But in the brain itself, the "use-it-or-lose-it" principle is at work: Unused neuron circuits are being pruned. While it may seem counterintuitive, the loss of unused neurons and neuronal connections actually improves brain functioning by making the remaining neurons more efficient in processing information.

By 6 years of age, the child's brain is about 95 percent of its adult size. This well-documented fact led to the mistaken belief that brain development is essentially complete by late childhood. But the longitudinal MRI studies of normal kids and adolescents revealed something very surprising—a *second* wave of gray matter overproduction just prior to puberty, followed by a *second* round

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Thus, it's entirely possible for some adolescents to have already completed physical and sexual maturation before their classmates have even begun puberty. Yet they would all be considered well within the normal age range for puberty (Sun & others, 2002).

Less obvious than the outward changes associated with puberty are the sweeping changes occurring in another realm of physical development: the adolescent's brain. We discuss these developments in the Focus on Neuroscience above.



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"Dad, when will I be old enough to shave?"

Factors Affecting the Timing of Puberty

Although you might be tempted to think that the onset of puberty is strictly a matter of biological programming, researchers have found that both genetics and environmental factors play a role in the timing of puberty. Genetic evidence includes the observation that girls usually experience menarche at about the same age as their mothers did (Ersoy & others, 2005). And, not surprisingly, the timing of pubertal changes tends to be closer for identical twins than for nontwin siblings (Mustanski & others, 2004).

Environmental factors, such as nutrition and health, also influence the onset of puberty. Generally, well-nourished and healthy children begin puberty earlier than do children who have experienced serious health problems or inadequate nutrition.

of neuronal pruning during the teenage years (Giedd & others, 2009; Toga & others, 2006).

Researchers are still not certain what causes this late childhood surge of cortical gray matter, but they know it is not due to a production of new neurons. Rather, the size, complexity, and connections among neurons all increase. This increase in gray matter peaks at about age 11 for girls and age 12 for boys (Toga & others, 2006).

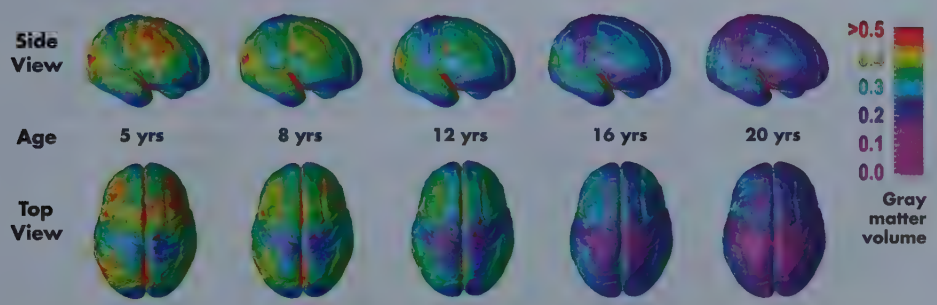
Pruning Gray Matter from Back to Front

The color-coded series of brain images below shows the course of brain development from ages 5 to 20 (Gogtay & others, 2004). Red indicates more gray matter; blue indicates less gray matter. Courtesy of UCLA neuroscientist Paul Thompson, you can also watch brief time-lapse "movies" of the changing brain at the following Web site: http://www.loni.ucla.edu/~thompson/DEVEL/dynamic.html.

The MRI images reveal that as the brain matures, neuronal connections are pruned and gray matter diminishes in a back-to-front wave. As pruning occurs, the connections that remain are strengthened and reinforced, and the amount of white matter in the brain steadily increases (Giedd, 2009; Schmithorst & Yuan, 2010). More specifically, the first brain areas to mature are at the extreme front and back of the brain. These areas are involved with very basic functions, such as processing sensations and movement. The next brain areas to mature are the *parietal lobes*, which are involved in language and spatial skills.

The last brain area to experience pruning and maturity is the *prefrontal cortex*. This is significant because the prefrontal cortex plays a critical role in many advanced or "executive" cognitive functions, such as a person's ability to reason, plan, organize, solve problems, and decide. And when does the prefrontal cortex reach full maturity? According to the MRI studies, not until a person reaches their mid-20s (Gogtay & others, 2004).

This suggests that an adolescent's occasional impulsive or immature behavior is at least partly a reflection of a brain that still has a long way to go to reach full adult maturity. During adolescence, emotions and impulses can be intense and compelling. But the parts of the brain that are responsible for exercising judgment are still maturing. The result can be behavior that is immature, impulsive, unpredictable—or even risky.



As living standards and health care have improved, the average age of puberty has steadily been decreasing in many countries over the past century.

For example, 150 years ago the average age of menarche in the United States and other developed countries was about 17 years old. Today it is about 13 years old. Boys, too, are beginning the physical changes of puberty about a year earlier today than they did in the 1960s (Irwin, 2005).

Body size and degree of physical activity are also related to the timing of puberty (Aksglaede & others, 2009). In general, heavier children begin puberty earlier than do lean children. Girls who are involved in physically demanding athletic activities, such as gymnastics, figure skating, dancing, and competitive running, can experience delays in menarche of up to two years beyond the average age (Brooks-Gunn, 1988; Georgopoulos & others, 2004).

Interestingly, the timing of puberty is also influenced by the absence of the biological father in the home. Several studies have found that girls raised in homes in which the biological father is absent tend to experience puberty earlier than girls raised in homes where the father is present (Bogaert, 2005a, 2008; Neberich & others, 2010). In another large study, *both* boys and girls experienced accelerated physical development in homes where fathers were absent (Mustanski & others, 2004).

Why would the absence of a father affect the timing of puberty? A stressful home environment may play a role. In families marked by marital conflict and strife, girls enter puberty earlier, regardless of whether the father remains or leaves (Saxbe & Repetti, 2009). In general, negative and stressful family environments are associated with an earlier onset of puberty, while positive family environments are associated with later physical development (Ellis & Essex, 2007). Although the mechanisms are not completely clear, it may be that stressful family events increase many of the same hormones that are involved in triggering puberty.

Courtesy of the Authors



Effects of Early Versus Late Maturation As anyone who remembers seventh-grade gym class can attest, the timing of puberty varies widely. Early maturation can have different effects for boys and girls. Early-maturing boys tend to be successful in athletics and popular with their peers, but they are more susceptible to risky behaviors, such as drug, alcohol, or steroid use (McCabe & Ricciardelli, 2004). Early-maturing girls tend to have more negative feelings about the arrival of puberty and body changes, have higher rates of teenage pregnancy, and may be embarrassed or harassed by unwanted attention from older males (Ge & others, 2003; Adair & Gordon-Larsen, 2001).

Effects of Early Versus Late Maturation

Adolescents tend to be keenly aware of the physical changes they are experiencing as well as of the *timing* of those changes compared with their peer group. Most adolescents are "on time," meaning that the maturational changes are occurring at roughly the same time for them as for others in their peer group.

However, some adolescents are "off time," experiencing maturation noticeably earlier or later than the majority of their peers. Generally speaking, off-time maturation is stressful for both boys and girls, who may experience teasing, social isolation, and exclusion from social activities (Conley & Rudolph, 2009).

Being off-time has different effects for girls and boys. Girls who develop early and boys who develop late are most likely to have problems. For example, early-maturing girls tend to be more likely than late-maturing girls to have negative feelings about their body image and pubertal changes, such as menarche (Ge & others, 2003). Compared to late-maturing girls, early-maturing girls are less likely to have received factual information concerning development. They may also feel embarrassed by unwanted attention from older males (Brooks-Gunn & Reiter, 1990). Early-maturing girls also have higher rates of sexual risk-taking, substance use, and delinquent behavior, and are at greater risk for unhealthy weight gain later in life (Adair & Gordon-Larsen, 2001; Belsky & others, 2010).

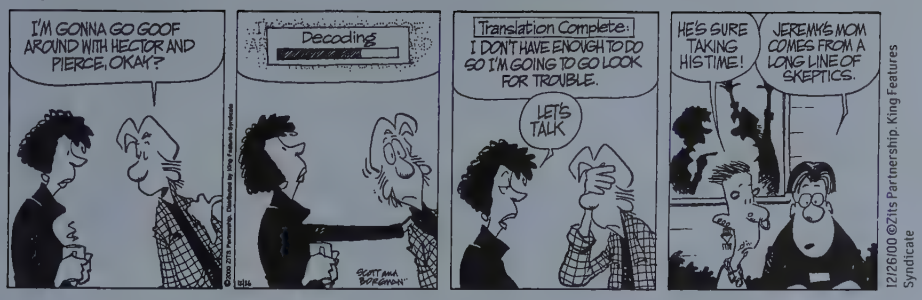
Early maturation can be advantageous for boys, but it is also associated with risks. Early-maturing boys tend to be popular with their peers. However, although they are more successful in athletics than late-maturing peers, they are also more susceptible to behaviors that put their health at risk, such as steroid use (McCabe & Ricciardelli, 2004). Early-maturing boys are also more prone to the symptoms of depression, problems at school, and engaging in drug or alcohol use (see Ge & others, 2003; Hayatbakhsh & others, 2009).

Social Development

The changes in adolescents' bodies are accompanied by changes in their social interactions, most notably with parents and peers. Contrary to what many people think, parent–adolescent relationships are generally positive. In fact, most teenagers report that they admire their parents and turn to them for advice (Steinberg, 1990, 2001). As a general rule, when parent–child relationships have been good before adolescence, they continue to be relatively smooth during adolescence. Adolescents who perceive their relationships with their parents as being warm and supportive have higher self-esteem and are most likely to follow their parents' guidance (McElhaney & others, 2008). However, some friction seems to be inevitable as children make the transition to adolescence. And, many developmental psychologists view the increased conflict in early and middle adolescence as healthy, a necessary stage in the adolescent's development of increased autonomy.

Although parents remain influential throughout adolescence, relationships with friends and peers become increasingly important. Adolescents usually encounter greater

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diversity among their peers as they make the transitions to middle school and high school. To a much greater degree than during childhood, the adolescent's social network, social context, and community influence his or her values, norms, and expectations.

Susceptibility to peer influence peaks during early adolescence (Dishion & Tipsord, 2011). As they grow older, adolescents develop resilience against peer influences and increasingly rely on parents' influences regarding appropriate behaviors (Cook & others, 2009; Sumter & others, 2009).

Parents often worry that peer influences will lead to undesirable behavior, but researchers have found that peer relationships tend to *reinforce* the traits and goals that parents fostered during childhood (Steinberg, 2001). This finding is not as surprising as it might seem. Adolescents tend to form friendships with peers who are similar in age, social class, race, and beliefs about drinking, dating, church attendance, and educational goals.

Although peer influence can lead to undesirable behaviors, peers can also influence one another in positive ways (Allen & others, 2008). Friends often exert pressure on one another to study, make good grades, attend college, and engage in prosocial behaviors. This positive influence is especially true for peers who are strong students (Cook & others, 2007).

Peer Relationships in Adolescence
Although parents often worry about the negative impact of peers, peers can also have a positive influence on one another. These boys volunteered to peel potatoes for over 100 Thanksgiving dinners being served to needy families in their Modesto, California community.



Debbie Noda/Modesto Bee/ZUMAPRESS.com

Romantic and sexual relationships also become increasingly important throughout the adolescent years. One national survey showed that by the age of 12, about one-quarter of adolescents reported having had a "special romantic relationship." By age 15, that percentage increased to 50 percent, and reached 70 percent by the age of 18 (Connolly & McIsaac, 2009).

Social and cultural factors influence when, why, and how adolescents engage in romantic and sexual behaviors. The beginning of dating, for example, coincides more strongly with cultural and social expectations and norms, such as when friends begin to date, than with an adolescent's degree of physical maturation (see Collins, 2003). In fact, there are stark cultural differences in the age at which adolescents begin to date. For example, 80 percent of Israeli 14-year-olds report some type of dating, as compared to only 50 percent of North Americans of the same age (Connolly & McIsaac, 2009).

The physical and social developments we've discussed so far are the more obvious changes associated with the onset of puberty. No less important, however, are the cognitive changes that allow the adolescent to think and reason in new, more complex ways.

Identity Formation: Erikson's Theory of Psychosocial Development

When psychologists talk about a person's **identity,** they are referring to her sense of self, including her memories, experiences, and the values and beliefs that guide her behavior. Our sense of personal identity gives us an integrated and continuing sense of self over time.

■ **identity** A person's sense of self, including his or her memories, experiences, and the values and beliefs that guide his or her behavior.

Identity formation is a process that continues throughout the lifespan. As we embrace new and different roles over the course of our lives, we define ourselves in new and different ways (Erikson & others, 1986; McAdams & Olson, 2010.)

For the first time in the lifespan, the adolescent possesses the cognitive skills necessary for dealing with identity issues in a meaningful way (Sebastian & others, 2008). Beginning in early adolescence, self-definition shifts. Preadolescent children tend to describe themselves in very concrete social and behavioral terms. An 8-year-old might describe himself by saying, "I play with Mark and I like to ride my bike." In contrast, adolescents use more abstract self-descriptions that reflect personal attributes, values, beliefs, and goals (Phillips, 2008). Thus, a 14-year-old might say, "I have strong religious beliefs, love animals, and hope to become a veterinarian."

Some aspects of personal identity involve characteristics over which the adolescent really has no control, such as gender, race, ethnic background, and socioeconomic level. In effect, these identity characteristics are fixed and already internalized by the time an individual reaches the adolescent years.

Beyond such fixed characteristics, the adolescent begins to evaluate herself on several different dimensions. Social acceptance by peers, academic and athletic abilities, work abilities, personal appearance, and romantic appeal are some important aspects of self-definition. Another challenge facing the adolescent is to develop an identity that is independent of her parents while retaining a sense of connection to her family. Thus, the adolescent has not one but several self-concepts that she must integrate into a coherent and unified whole to answer the question "Who am I?"

The adolescent's task of achieving an integrated identity is one important aspect of psychoanalyst **Erik Erikson**'s influential theory of psychosocial development. Briefly, Erikson (1968) proposed that each of eight stages of life is associated with a particular psychosocial conflict that can be resolved in either a positive or a negative direction (see Table 9.4). Relationships with others play an important role in determining the outcome of each conflict. According to Erikson, the key psychosocial conflict facing adolescents is *identity versus role confusion.*

To successfully form an identity, adolescents must not only integrate various dimensions of their personality into a coherent whole but also define the roles that they will adopt within the larger society on becoming an adult (Bohn & Berntsen, 2008). To accomplish this, adolescents grapple with a wide variety of issues, such as selecting a potential career and formulating religious, moral, and political beliefs. They must also adopt social roles involving interpersonal relationships, sexuality, and long-term commitments such as marriage and parenthood.

In Erikson's (1968) theory, the adolescent's path to successful identity achievement begins with *role confusion,* which is characterized by little sense of commitment on any of these issues. This period is followed by a *moratorium period,* during which the adolescent experiments with different roles, values, and beliefs. Gradually, by choosing among the alternatives and making commitments, the adolescent arrives at an *integrated identity.*



Sarah Putnam/The Picture Cube/Index Stock

Psychoanalyst Erik Erikson
Erikson (1902–1994) is shown here with his wife, Joan, in 1988. Erikson's landmark theory of psychosocial development stressed the importance of social and cultural influences on personality throughout the stages of life.

Psychological research has generally supported Erikson's description of the process of identity formation (Phillips, 2008). However, it's important to keep in mind that identity continues to evolve over the entire lifespan, not just during the adolescent years (Whitbourne & others, 2009). Adolescents and young adults seem to achieve a stable sense of identity in some areas earlier than in others. Far fewer adolescents and young adults have attained a stable sense of identity in the realm of religious and political beliefs than in the realm of vocational choice.

TABLE 9.4

Erik Erikson's Psychosocial Stages of Development

Life Stage	Psychosocial Conflict	Positive Resolution	Negative Resolution
Infancy (birth to 18 months)	Trust vs. mistrust	Reliance on consistent and warm caregivers produces a sense of predictability and trust in the environment.	Physical and psychological neglect by caregivers leads to fear, anxiety, and mistrust of the environment.
Toddlerhood (18 months to 3 years)	Autonomy vs. doubt	Caregivers encourage independence and self-sufficiency, promoting positive self-esteem.	Overly restrictive caregiving leads to self-doubt in abilities and low self-esteem.
Early childhood (3 to 6 years)	Initiative vs. guilt	The child learns to initiate activities and develops a sense of social responsibility concerning the rights of others; promotes self-confidence.	Parental overcontrol stifles the child's spontaneity, sense of purpose, and social learning; promotes guilt and fear of punishment.
Middle and late childhood (6 to 12 years)	Industry vs. inferiority	Through experiences with parents and "keeping up" with peers, the child develops a sense of pride and competence in schoolwork and home and social activities.	Negative experiences with parents or failure to "keep up" with peers leads to pervasive feelings of inferiority and inadequacy.
Adolescence	Identity vs. role confusion	Through experimentation with different roles, the adolescent develops an integrated and stable self-definition; forms commitments to future adult roles.	An apathetic adolescent or one who experiences pressures and demands from others may feel confusion about his or her identity and role in society.
Young adulthood	Intimacy vs. isolation	By establishing lasting and meaningful relationships, the young adult develops a sense of connectedness and intimacy with others.	Because of fear of rejection or excessive self-preoccupation, the young adult is unable to form close, meaningful relationships and becomes psychologically isolated.
Middle adulthood	Generativity vs. stagnation	Through child rearing, caring for others, productive work, and community involvement, the adult expresses unselfish concern for the welfare of the next generation.	Self-indulgence, self-absorption, and a preoccupation with one's own needs lead to a sense of stagnation, boredom, and a lack of meaningful accomplishments.
Late adulthood	Ego integrity vs. despair	In reviewing his or her life, the older adult experiences a strong sense of self-acceptance and meaningfulness in his or her accomplishments.	In looking back on his or her life, the older adult experiences regret, dissatisfaction, and disappointment about his or her life and accomplishments.

Source: Adapted from Erikson (1964a).

The Development of Moral Reasoning

An important aspect of cognitive development during adolescence is a change in **moral reasoning**—how an individual thinks about moral and ethical decisions. Adolescents and adults often face moral decisions on difficult interpersonal and social issues (Hart, 2005). What is the right thing to do at a given time and place? How is the best possible outcome achieved for all? The adolescent's increased capacities to think abstractly, imagine hypothetical situations, and compare ideals to the real world all affect his thinking about moral issues (Fox & Killen, 2008; Kagan & Sinnott-Armstrong, 2008; Turiel, 2010).

The most influential theory of moral development was proposed by **Lawrence Kohlberg** (1927–1987). Kohlberg's interest in moral development may have been triggered by his experiences as a young adult (see photo on next page). Kohlberg (1976, 1984) used hypothetical moral dilemmas to investigate moral reasoning, such as whether a husband should steal a drug he could not afford to cure his dying wife.

moral reasoning The aspect of cognitive development that has to do with how an individual reasons about moral decisions.



Lee Lockwood/Time & Life Pictures/Getty Images

Lawrence Kohlberg (1927–1987)

After graduating from high school in 1945, Kohlberg joined the Merchant Marines. In Europe, he witnessed the aftermath of World War II and met many Holocaust survivors. After finishing his service in the Merchant Marines, Kohlberg helped smuggle Jewish refugees into what was then British-controlled Palestine. He was caught and briefly imprisoned by the British but escaped and eventually made his way back to the United States (Schwartz, 2004). Years later, Kohlberg (1986) wrote, "My experience with illegal immigration into Israel raised all sorts of moral questions, issues which I saw as issues of justice. Was using death or violence right or just for a political end? When is it permissible to be involved with violent means for supposedly just ends?" Kohlberg was to be preoccupied with themes of justice and morality for the rest of his life.

Kohlberg analyzed the responses of children, adolescents, and adults to such hypothetical moral dilemmas, focusing on the *reasoning* that they used to justify their answers rather than the answers themselves. He concluded that there are distinct *stages* of moral development. Like Piaget's stages of cognitive development, Kohlberg (1981) believed that moral development unfolded in an age-related, step-by-step fashion.

Kohlberg proposed three distinct *levels* of moral reasoning: *preconventional, conventional,* and *postconventional.* Each level is based on the degree to which a person conforms to conventional standards of society. Furthermore, each level has two *stages* that represent different degrees of sophistication in moral reasoning. Table 9.5 describes the characteristics of the moral reasoning associated with each of Kohlberg's levels and stages.

Kohlberg (1984) found that the responses of children under the age of 10 reflected *preconventional* moral reasoning based on self-interest—avoiding punishment and maximizing personal gain. Beginning in late childhood and continuing through adolescence and adulthood, responses typically reflected conventional moral reasoning, which emphasizes social roles, rules, and obligations. Thus, the progression from preconventional to conventional moral reasoning is closely associated with age-related cognitive abilities (Eisenberg & others, 2005; Olthof & others, 2008).

Do people inevitably advance from conventional to postconventional moral reasoning, as Kohlberg once thought? In a 20-year longitudinal study, Kohlberg followed a group of boys from late childhood through early adulthood. Of the 58 participants in the study, only 8 occasionally displayed stage 5 reasoning, which emphasizes respect for legal principles that protect all members of society. *None* of the participants showed stage 6 reasoning, which reflects self-chosen ethical principles that are universally applied (Colby & others, 1983). Kohlberg and his colleagues eventually dropped stage 6 from the theory, partly because clear-cut expressions of "universal moral principles" were so rare (Gibbs, 2003; Rest, 1983).

Kohlberg's original belief that the development of abstract thinking in adolescence naturally and invariably leads people to the formation of idealistic moral principles has not been supported. Only a few exceptional people display the philosophical ideals in Kohlberg's highest level of moral reasoning. The normal course of changes in moral reasoning for most people seems to be captured by Kohlberg's first four stages (Colby & Kohlberg, 1984). By adulthood, the predominant form of moral reasoning is conventional moral reasoning, reflecting the importance of social roles and rules.

TABLE 9.5

Kohlberg's Levels and Stages of Moral Development

I. Preconventional Level

Moral reasoning is guided by external consequences. No internalization of values or rules.

Stage 1: Punishment and Obedience

"Right" is obeying the rules simply to avoid punishment because others have power over you and can punish you.

Stage 2: Mutual Benefit

"Right" is an even or fair exchange so that both parties benefit. Moral reasoning guided by a sense of "fair play."

II. Conventional Level

Moral reasoning is guided by conformity to social roles, rules, and expectations that the person has learned and internalized.

Stage 3: Interpersonal Expectations

"Right" is being a "good" person by conforming to social expectations, such as showing concern for others and following rules set by others so as to win their approval.

Stage 4: Law and Order

"Right" is helping maintain social order by doing one's duty, obeying laws simply because they are laws, and showing respect for authorities simply because they are authorities.

III. Postconventional Level

Moral reasoning is guided by internalized legal and moral principles that protect the rights of all members of society.

Stage 5: Legal Principles

"Right" is helping protect the basic rights of all members of society by upholding legalistic principles that promote the values of fairness, justice, equality, and democracy.

Stage 6: Universal Moral Principles

"Right" is determined by self-chosen ethical principles that reflect the person's respect for ideals such as nonviolence, equality, and human dignity. If these moral principles conflict with democratically determined laws, the person's self-chosen moral principles take precedence.

Sources: Based on Kohlberg (1981) and Colby & others (1983).

Kohlberg's theory has been criticized on several grounds (see Krebs & Denton, 2005, 2006). Probably the most important criticism of Kohlberg's theory is that moral *reasoning* doesn't always predict moral *behavior.* People don't necessarily respond to real-life dilemmas as they do to the hypothetical dilemmas that are used to test moral reasoning. Further, people can, and do, respond at different levels to different kinds of moral decisions. As Dennis Krebs and Kathy Denton (2005) point out, people are *flexible* in their real-world moral behavior: The goals that people pursue affect the types of moral judgments they make.

Similarly, Kohlberg's theory is a theory of cognitive development, focusing on the type of conscious reasoning that people use to make moral decisions. However, as Jonathan Haidt (2007, 2010) points out, moral decisions in the real world are often affected by nonrational processes, such as emotional responses, custom, or tradition. For example, if your beloved dog was killed by a car, would it be morally wrong to cook and eat it? Many people would instinctively say "yes," but probably not because of a well-considered, reasoned argument (Haidt & others, 1993). Haidt (2010) argues that moral decisions are *always* embedded in particular social contexts and influenced, often without our awareness, by emotions and social and cultural beliefs.



Reuters/Will Burgess

Moral Development: Developing a Sense of Right and Wrong As adolescents develop new cognitive abilities, they become more aware of moral issues in the world. Their newly acquired ability to imagine hypothetical situations and compare abstract ideals to the reality of situations often leads them to question authority or take action against perceived injustices. This young Australian Amnesty International volunteer is wearing a cloth gag across her mouth to protest the Chinese government's censorship, monitoring, and surveillance of Internet users in China.

Gender, Culture, and Moral Reasoning

Other challenges to Kohlberg's theory questioned whether it was as universal as its proponents claimed. Psychologist Carol Gilligan (1982) pointed out that Kohlberg's early research was conducted entirely with male subjects, yet it became the basis for a theory applied to both males *and* females. Gilligan also noted that in most of Kohlberg's stories, the main actor who faces the moral dilemma to be resolved is a male. When females are present in the stories, they often play a subordinate role. Thus, Gilligan believes that Kohlberg's model reflects a male perspective that may not accurately depict the development of moral reasoning in women.

To Gilligan, Kohlberg's model is based on an *ethic of individual rights and justice,* which is a more common perspective for men. In contrast, Gilligan (1982) developed a model of women's moral development that is based on an *ethic of care and responsibility.* In her studies of women's moral reasoning, Gilligan found that women tend to stress the importance of maintaining interpersonal relationships and responding to the needs of others, rather than focusing primarily on individual rights (Gilligan & Attanucci, 1988).

> The hallmark of morality resides less in the ability to resolve abstract moral dilemmas or even figure out how, ideally, others should behave; the hallmark resides more in people's tendency to apply the same moral standards to themselves that they apply to others and to function in accordance with them.
>
> *Dennis Krebs and Kathy Denton (2006)*

But *do* women use different criteria in making moral judgments? In a meta-analysis of studies on gender differences in moral reasoning, Sara Jaffee and Janet Shibley Hyde (2000) found only slight differences between male and female responses. Instead, evidence suggested that *both* men and women used a mix of care and justice perspectives. Thus, while disputing Gilligan's idea that men and women had entirely different approaches to moral reasoning, Jaffe and Hyde found empirical support for Gilligan's larger message: that Kohlberg's theory did *not* adequately reflect the way that humans actually experienced moral decision making.

Despite Kohlberg's belief that the stages of moral development were universal, culture also affects moral reasoning (Graham & others, 2011; Haidt, 2007). Kohlberg's moral decisions focus on issues of harm, fairness, and justice. In many cultures, however, other domains are equally deemed to be morally important. For example, religious or spiritual purity, loyalty to one's family or social group, respect for those in authority, and respect for tradition may also be seen as issues of morality. From this perspective, Kohlberg's theory is narrowly focused on just one area of morality—harm, fairness, and justice.

Some cross-cultural psychologists also argue that Kohlberg's stories and scoring system reflect a Western emphasis on *individual* rights and justice that is not shared in many cultures (Shweder & others, 1997). For example, Kohlberg's moral stages do not reflect the sense of interdependence and the concern for the overall welfare of the group that is more common in collectivistic cultures. Cultural psychologist Harry Triandis (1994)



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"I'm sorry, but I'm morally and politically opposed to hangman."

reports an example of a response that does not fit into Kohlberg's moral scheme. In response to the scenario in which the husband steals the drug to save his wife's life, a man in New Guinea said, "If nobody helped him, I would say that *we* had caused the crime." Thus, there are aspects of moral reasoning in other cultures that do not seem to be reflected in Kohlberg's theory (Haidt, 2007; Shweder & Haidt, 1993).



Adult Development

KEY THEME

› Development during adulthood is marked by physical changes and the adoption of new social roles.

KEY QUESTIONS

› What physical changes take place in adulthood?

› What are some general patterns of adult social development?

› What characterizes career paths in adulthood?

You can think of the developmental changes you experienced during infancy, childhood, and adolescence as early chapters in your life story. Those early life chapters helped set the tone and some of the themes for the primary focus of your life story—adulthood. During the half-century or more that constitutes adulthood, predictable changes continue to occur. Self-definition evolves as people achieve independence and take on new roles and responsibilities. As you'll see in this section, the story of adulthood also reflects the increasing importance of individual variation. Although general patterns of aging exist, our life stories become more distinct and individualized with each passing decade of life (Ram & others, 2009).

Physical Changes

Your unique genetic heritage greatly influences the unfolding of certain physical changes during adulthood, such as when your hair begins to thin and turn gray. Such genetically influenced changes can vary significantly from one person to another.

However, genetic heritage is *not* destiny. The lifestyle choices that people make in young and middle adulthood influence the aging process. Staying physically and mentally active, avoiding tobacco products and other harmful substances, and eating a healthy diet can both slow and minimize the physical declines that are typically associated with aging.

Another potent environmental force is simply the passage of time. Decades of use and environmental exposure take a toll on the body. Wrinkles begin to appear as we approach the age of 40, largely because of a loss of skin elasticity combined with years of making the same facial expressions. With each decade after age 20, the efficiency of various body organs declines. For example, lung capacity decreases, as does the amount of blood pumped by the heart, though these changes are usually not noticeable until late adulthood.

Physical strength typically peaks in *early adulthood*, the 20s and 30s. By *middle adulthood*, roughly from the 40s to the mid-60s, physical strength and endurance gradually decline. Physical and mental reaction times also begin to slow during middle adulthood. During *late adulthood*, from the mid-60s on, physical stamina and reaction time tend to decline further and faster.

Significant reproductive and hormonal changes also occur during adulthood. In women, **menopause,** the cessation of menstruation, signals the end of reproductive capacity and occurs anytime from the late 30s to the early 50s. For some women, menopause involves unpleasant symptoms, such as *hot flashes,* which are rapid and extreme increases in body temperature (Umland, 2008). Other symptoms may include disturbances in sex drive, sleep, eating, weight, and motivation. Emotional symptoms may include depression, sadness, and emotional instability (Freeman, 2010).

menopause The natural cessation of menstruation and the end of reproductive capacity in women.

Cultural stereotypes reinforce the notion that menopause is mostly a negative experience (APA, 2007). However, many women experience "postmenopausal zest." Freed of menstruation, childbearing, and worries about becoming pregnant, many women feel a renewed sense of energy, freedom, and happiness. Postmenopausal women often develop a new sense of identity, become more assertive, and pursue new aspirations (Fahs, 2007). In many cultures, postmenopausal women are valued for their experience and wisdom (Robinson, 2002).

Middle-aged men do not experience an abrupt end to their reproductive capability. However, they do experience a gradual decline in testosterone levels, a condition sometimes called *andropause* (Hochreiter & others, 2005). Decreased levels of the hormone testosterone cause changes in physical and psychological health. These changes include loss of lean muscle, increased body fat, weakened bones, reduced sexual motivation and function, and cognitive declines (Harmon, 2005). Emotional problems such as depression and irritability may also occur.

Social Development

In his theory of psychosocial development, Erik Erikson (1982) described the two fundamental themes that dominate adulthood: love and work. According to Erikson (1964b, 1968), the primary psychosocial task of early adulthood is to form a committed, mutually enhancing, intimate relationship with another person. During middle adulthood, the primary psychosocial task becomes one of *generativity*—to contribute to future generations through your children, your career, and other meaningful activities. In this section, we'll consider the themes of love and work by examining adult friendships, marriage, family life, and careers.

Psychosocial Development in Young Adulthood Young adulthood brings many psychological challenges and transitions, not the least of which is choosing a life partner. According to psychoanalyst Erik Erikson (1968), the key psychosocial conflict of young adulthood is *intimacy versus isolation*. Erikson believed that the ability to establish a meaningful, intimate, and lasting relationship helps set the stage for healthy adult development.



MARKA/Alamy

Friends and Lovers in Adulthood

Largely because of competing demands on their time, adults typically have fewer friends than adolescents do. The focus of adult friendships is somewhat different for men and women. Female friends tend to confide in one another about their feelings, problems, and interpersonal relationships. In contrast, male friends typically minimize discussions about relationships or personal feelings or problems. Instead, male friends tend to pursue mutually interesting activities together, such as hobbies or sports (Greif, 2009; Vigil, 2007).

Beyond friendship, establishing a committed, intimate relationship takes on a new urgency in adulthood. Looking for Mr. or Ms. Right, getting married or establishing a committed relationship, and starting a family are the traditional tasks of early adulthood. However, in contrast to their parents, today's young adults are marrying at a later average age. As Figure 9.6 on the next page shows, in 1960 the median age for a first marriage was 23 for men and 20 for women. By 2009 those averages had increased to age 28 for men and age 26 for women. Many young adults postpone marriage until their late 20s or early 30s so they can finish their education and become established in a career (Bernstein, 2010).

And, of course, it is a mistake to assume that the "traditional" family is the norm. There are many Americans who either never marry or don't remarry after they are widowed or divorced. Among adults in the 20 to 34 age range, just over half of women and 60 percent of men have never been married. However, by age 55, only about 7 percent of the adult population has never been married (U.S. Census Bureau, 2009).

The Transition to Parenthood: Kids 'R' Us?

Although it is commonly believed that children strengthen the marital bond, marital satisfaction and time together tends to decline after the birth of the first child (Doss & others, 2009; Lawrence & others, 2010). For all the joy that can be derived from watching a child grow and experience the world, the first child's arrival creates a whole new set of responsibilities, pushes, and pulls on the marital relationship.

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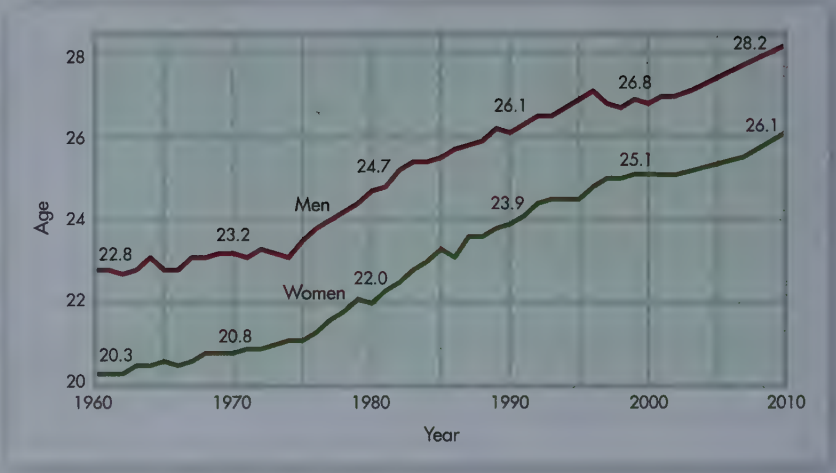


FIGURE 9.6 The Median Age at First Marriage The average age at first marriage is five years older for young adults today than it was in the 1970s. Part of the explanation for this trend is that more people are postponing marriage in order to complete a college education. Among young adults in the 25 to 34 age range, 26 percent of men and 33 percent of women have earned a bachelor's degree or higher.

Source: U.S. Census Bureau (2008a, 2008b, 2008c).

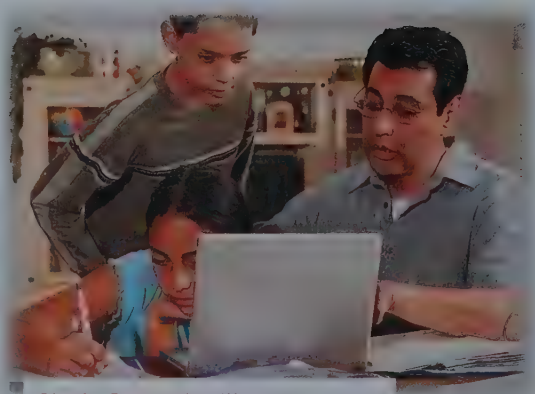
Without question, parenthood fundamentally alters your identity as an adult. With the birth or adoption of your first child, you take on a commitment to nurture the physical, emotional, social, and intellectual well-being of the next generation. This change in your identity can be a struggle, especially if the transition to parenthood was more of a surprise than a planned event (Grussu & others, 2005)

Parenthood is further complicated by the fact that children are not born speaking fluently so that you can immediately enlighten them about the constraints of adult schedules, deadlines, finances, and physical energy. Instead, you must continually strive to adapt lovingly and patiently to your child's needs while managing all the other priorities in your life.

Not all couples experience a decline in marital satisfaction after the birth of a child. The hassles and headaches of child rearing can be minimized if the marital relationship is warm and positive, and if both husband and wife share household and child-care responsibilities (Tsang & others, 2003). The transition to parenthood is also smoother if you're blessed with a child who is born with a good disposition. Parents of babies with an "easy" temperament find it less difficult to adjust to their new role and maintain a healthy marital relationship (Mehall & others, 2009).

That many couples are marrying at a later age and waiting until their 30s to start a family also seems to be advantageous. Becoming a parent at an older age and waiting longer after marriage to start a family may ease the adjustment to parenthood. Why? Largely because the couple is more mature, the marital relationship is typically more stable, and finances are more secure (Hatton & others, 2010).

Although marital satisfaction declines when people first become parents, it rises again after children leave home (Gorchoff & others, 2008). Successfully launching your children into the adult world represents the attainment of the ultimate parental goal. It also means there is more time to spend in leisure activities with your spouse. Not surprisingly, then, marital satisfaction tends to increase steadily once children are out of the nest and flying on their own.



Hill Street Studios/Jupiterimages

Single-Parent Families Today, more than 30 percent of all children are being raised by a single parent. Many single parents provide their children with a warm, stable, and loving environment. In terms of school achievement and emotional stability, children in stable single-parent households do just as well as children with two parents living in the same home (Dawson, 1991).

Variations in the Paths of Adult Social Development

Up to this point, we've described the "traditional" track of adult social development: finding a mate, getting married, starting and raising a family. However, there is enormous diversity in how the goal of intimacy is realized during adulthood. Only a quarter of women in the United States and about fifteen percent of men marry before the age of 23 (Uecker & Stokes, 2008).

Today, the structure of American families varies widely (see Figure 9.7). For example, the number of unmarried couples living together increased dramatically at the end of the twentieth century—to well over 3 million couples. Currently, more than 30 percent of children are being raised by a single parent.

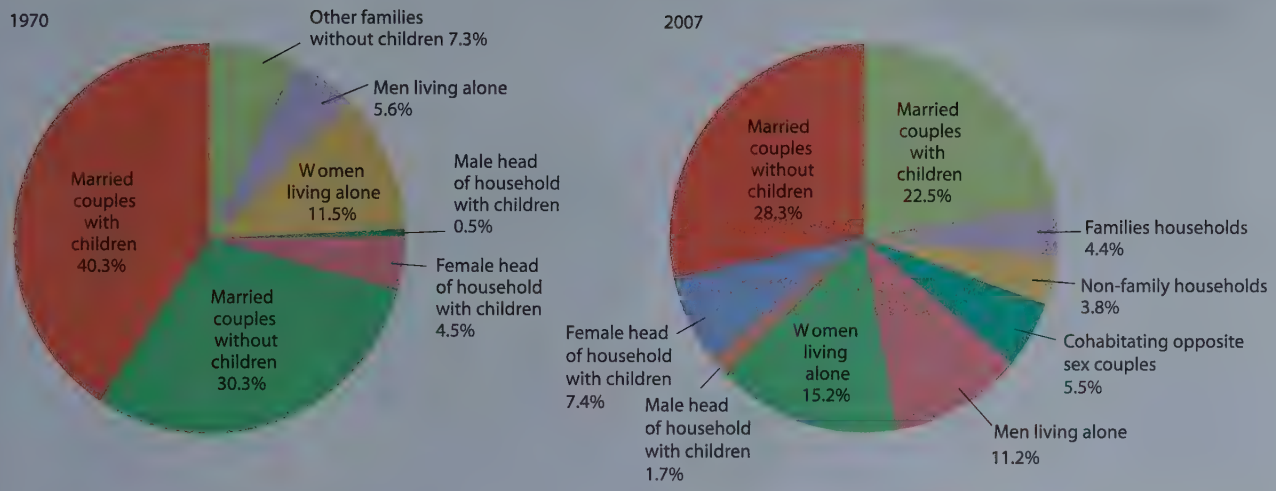


FIGURE 9.7 The Changing Structure of American Families and Households In a relatively short time, American households have undergone a metamorphosis. Between 1970 and 2007, the number of American households increased from 63 million to 116 million, but the average household size decreased from 3.14 to 2.56 persons. As the living arrangements of American families have become more diversified, the U.S. Census Bureau modified the categories it uses to classify households. Hence, the two pie charts differ slightly. Notice that single-parent family groups have doubled. Today, single mothers or fathers represent 9 percent of all households. In contrast, the number of married couples with children has sharply decreased.

Sources: Kreider, 2008; U.S. Census Bureau, 2008c, 2008d.

Given that more than half of all first marriages end in divorce, the phenomenon of remarrying and starting a "second family" later in life is not unusual. As divorce has become more common, the number of single parents and stepfamilies has also risen. And among married couples, some opt for a "child-free" life together. There are also gay and lesbian couples who, like many heterosexual couples, are committed to a long-term, monogamous relationship (Balsam & others, 2008; Goldberg, 2010; Rothblum & Hope, 2009).

Such diversity in adult relationships reflects the fact that adult social development does not always follow a predictable pattern. As you travel through adulthood, your life story may include many unanticipated twists in the plot and changes in the cast of characters. Just as the "traditional" family structure has its joys and heartaches, so do other configurations of intimate and family relationships. In the final analysis, *any* relationship that promotes the overall sense of happiness and well-being of the people involved is a successful one.



Blended Families Approximately 17 percent of all children live in stepfamilies or *blended families*, sharing their home with children from an earlier marriage of their parent or stepparent (U.S. Census Bureau, 2004a).

Although the term *blended families* is commonly used, not all stepfamilies agree with its use, pointing out that children in stepfamilies do not lose their identification or emotional attachment to the parent who is not part of the new household (Stepfamily Association of America, 2005).

Careers in Adulthood

People follow a variety of routes in developing careers (Duffy & Sedlacek, 2007). Most people explore different career options, narrow down those options, and tentatively commit to a particular job in a particular field in young adulthood. However, studies have found that close to a third of people in their late 20s and early 30s do not just change jobs within a particular field—they completely switch occupational

CRITICAL THINKING

The Effects of Child Care on Attachment and Development

The majority of children under the age of 5 in the United States—more than 11 million children—are in some type of child care (Phillips & Lowenstein, 2011). On average, the infants, toddlers, and preschoolers of working parents spend 36 hours a week in child care (NACCRRA, 2010). Does extensive day care during the first years of life create insecurely attached infants and toddlers? Does it produce negative effects in later childhood? Let's look at the evidence.

Developmental psychologist Jay Belsky (1992, 2001, 2002) sparked considerable controversy when he first published studies showing that infants under a year old were more likely to demonstrate insecure attachment if they experienced over 30 hours of day care per week. Based on his research, Belsky contended that children who entered full-time day care before their first birthday were "at risk" to be insecurely attached to their parents. He also claimed that extensive experience with nonmaternal care was linked to aggressive behavior in preschool and kindergarten.

However, reviewing the data in Belsky's and other early studies, psychologist Alison Clarke-Stewart (1989, 1992) pointed out that the actual difference in attachment was quite small when infants experiencing day care were compared with infants cared for by a parent. The proportion of insecurely attached infants in day care is only slightly higher than the proportion typically found in the general population (Lamb & others, 1992).

In other words, *most* of the children who had started day care in infancy were securely attached, just like most of the children who had not experienced extensive day care during infancy (Phillips & Lowenstein, 2011). Similarly, a large, long-term study of the effects of child care on attachment found that spending more hours per week in day care was associated with insecure attachment only in preschoolers who also experienced less sensitive and less responsive maternal care (NICHD, 2006). Preschoolers whose mothers were sensitive and responsive showed no greater likelihood of being insecurely attached, regardless of the number of hours spent in day care.

Researchers agree that the *quality* of child care is a key factor in facilitating secure attachment in early childhood and preventing problems in later childhood (NICHD, 2003a, 2003b; Vandell & others, 2010). Many studies have found that children who experience high-quality child care tend to be more sociable, better adjusted, and more academically competent than children who experience low-quality care, even well into their teens (Belsky & others, 2007; Vandell & others, 2010). They also have fewer behavior problems than children who experience lower-quality care (McCartney & others, 2010).

Child care is just one aspect of a child's developmental environment. Sensitive parenting and the quality of caregiving in the child's home have been found to have an even greater influence on social, emotional, and cognitive development than the quality of child care (Belsky & others, 2007).

Clearly, then, day care in and of itself does not necessarily lead to undesirable outcomes (Belsky, 2009). The critical factor is the *quality* of care (Phillips & Lowenstein, 2011). High-quality day care can benefit children, even when it begins in early infancy. In contrast, low-quality care can contribute to social and academic problems in later childhood (Muenchow & Marsland, 2007). Unfortunately, in many areas of the United States, high-quality day care is not readily available or is prohibitively expensive (Phillips & Lowenstein, 2011).



Ron Nickel/Design Pics/Newscom

Individual Attention and Learning Activities High-quality child care centers offer a variety of age-appropriate (and fun!) activities, toys, and experiences that help nurture a child's motor, cognitive, and social skills. Individual attention from consistent caregivers or teachers helps foster the young child's sense of predictability and security in the care setting.

Characteristics of High-Quality Child Care

The setting meets state and local standards, and is accredited by a professional organization, such as the National Association for the Education of Young Children.

- Warm, responsive caregivers encourage children's play and learning.
- Groups of children and adults are consistent over time, helping foster stable, positive relationships. Low staff turnover is essential.
- Groups are small enough to provide the individual attention that very young children need.
- A minimum of two adults care for no more than 8 infants, 12 toddlers, or 20 four- and five-year-olds.
- Caregivers are trained in principles of child development and learning.
- Developmentally appropriate learning materials and toys are available that offer interesting, safe, and achievable activities.

Sources: Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2006; National Association for the Education of Young Children, 2009; National Association of Child Care Resource & Referral Agencies, 2008.

fields (Phillips & Blustein, 1994). Social and economic circumstances can also affect occupational choices. For example, during times of economic crisis, people are more open to changing jobs and beginning new careers (Straczynski, 2009).

In developed societies, dual-career families have become increasingly common. However, the career tracks of men and women often differ if they have children. Although today's fathers are more actively involved in child rearing than were fathers in previous generations, women still tend to have primary responsibility for child

care (Meier & others, 2006). Thus, married women with children are much more likely than are single women or childless women to interrupt their careers, leave their jobs, or switch to part-time work because of child-rearing responsibilities. As a consequence, women with children tend to earn less than childless women (Gangl & Ziefle, 2009).

Many working parents are concerned about the effects of nonparental care on their children. Earlier in the chapter, we discussed the importance of attachment relationships between young children and their primary caregivers. In the Critical Thinking Box on page 396, we take a close look at what psychologists have learned about the effects of day care on attachment and other aspects of development.

Do adults, particularly women, experience greater stress because of the conflicting demands of career, marriage, and family? Not necessarily. Generally, multiple roles seem to provide both men and women with a greater potential for increased feelings of self-esteem, happiness, and competence (Cinamon & others, 2007). The critical factor seems to be not the *number* of roles that people take on but the *quality* of their experiences on the job, in marriage, and as a parent (Lee & Phillips, 2006; Plaisier & others, 2008). When experiences in different roles are positive and satisfying, psychological well-being is enhanced. However, when work is dissatisfying, finding high-quality child care is difficult, and making ends meet is a never-ending struggle, stress can escalate and psychological well-being can plummet—for either sex (Bakker & others, 2008).

Late Adulthood and Aging

KEY THEME

› Late adulthood does not necessarily involve a steep decline in physical or cognitive capabilities.

KEY QUESTIONS

› What cognitive changes take place in late adulthood?

› What factors influence social development in late adulthood?



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"This next one is a hard-rockin', kick-ass, take-no-prisoners tune we wrote about turning sixty."

The average life expectancy for men in the United States is currently about 76 years, and for women, about 81 years (Xu & others, 2009). Thus, the stage of late adulthood can easily last a decade or more. It has been projected that by the year 2050, the number of United States residents over the age of 65 will double, going from 39 million today to 89 million (U.S. Census Bureau, 2009).

Although we experience many physical and sensory changes throughout adulthood, that's not to say that we completely fall apart when we reach our 60s, 70s, or even 80s. Contrary to many young people's misconceptions of late adulthood, *most* older adults live healthy, active, and self-sufficient lives (National Institute on Aging, 2007; Wurtele, 2009). Even adults 85 years and older report good health and functioning despite increasing prevalence of disease and impairment (Collerton & others, 2009). For many people, good health and well-being reaches well into the latest stages of adulthood (Charles & Carstensen, 2010).

Cognitive Changes

During which decade of life do you think people reach their intellectual peak? If you answered the 20s or 30s, you may be surprised by the results of research. Decades of work by K. Warner Schaie (1995, 2005) and his colleagues has shown that mental abilities remain relatively stable until about the age of 60. After age 60, slight declines begin to appear on tests of general intellectual abilities, such as logical reasoning, math skills, word recall, and the ability to mentally manipulate images (Alwin, 2009; Siegler & others, 2009).

activity theory of aging The psychosocial theory that life satisfaction in late adulthood is highest when people maintain the level of activity they displayed earlier in life.

But even after age 60, most older adults maintain their previous levels of ability. A longitudinal study of adults in their 70s, 80s, and 90s found that there were slight but significant declines in memory, perceptual speed, and fluency. However, measures of knowledge, such as vocabulary, remained stable up to age 90 (Singer & others, 2003; Zelinski & Kennison, 2007). When declines in mental abilities occur during old age, Schaie (2005) found, the explanation is often simply a lack of practice or experience with the kinds of tasks used in mental ability tests. Even just a few hours of training on mental skills can improve test scores for most older adults.

Some research suggests that physiological functioning of the brain begins to slow with age (Salthouse, 2009). Neurons appear to become less efficient at communicating with one another and this seems to result in slowed and sometimes inhibited cognitive performance (Bucur & others, 2008). According to one hypothesis, older brains appear to *compensate* for this decline in processing speed by out-sourcing some of the work to other parts of the brain (Dennis & Cabeza, 2008). However, the need to recruit more regions of the brain comes at a price—slower processing.

Is it possible to minimize declines in mental and physical abilities in old age? In a word, *yes.* Consistently, research has found that those who are better educated and engage in physical and mental activities throughout older adulthood show the smallest declines in mental abilities (Boron & others, 2007; Colcombe & Kramer, 2003; Winningham, 2010). Aerobic exercise has been shown to be especially effective in improving cognitive functioning in late adulthood (Hertzog & others, 2009). The Focus on Neuroscience, "Boosting the Aging Brain," provides a look at a new experiment that demonstrated the remarkable effects of a moderate exercise program on the brains of elderly adults.

In contrast, the greatest intellectual declines tend to occur in older adults with unstimulating lifestyles, such as people who live alone, are dissatisfied with their lives, and engage in few activities (see Calero-Garcia & others, 2007; Newson & Kemps, 2005).

Social Development

One theory of social development in late adulthood holds that older adults gradually "disengage," or withdraw, from vocational, social, and relationship roles as they face the prospect of their lives ending (Lange & Grossman, 2010). But consider Sandy's father, Erv. Even after Erv was well into his 80s, he bowled in a league every Tuesday night, and would join about a dozen other retired men in their 70s and 80s for lunch and a monthly poker game.

What Erv and his buddies epitomized is the activity theory of aging. According to the **activity theory of aging,** life satisfaction in late adulthood is highest when you maintain your previous level of activity, either by continuing old activities or by finding new ones (Lange & Grossman, 2010).

Just like younger adults, older adults differ in the level of activity they find personally optimal. Some older adults pursue a busy lifestyle of social activities, travel, college classes, and volunteer work. Other older adults are happier with a quieter lifestyle, pursuing hobbies, reading, or simply puttering around their homes. Such individual preferences reflect lifelong temperamental and personality qualities that continue to be evident as a person ages.

For many older adults, caregiving responsibilities can persist well into late adulthood. Sandy's mother, Fern, for example, spent a great deal of time helping out with her young grandchildren and caring for some of her older relatives. She was not unusual in that respect. Many older adults who are healthy and active find themselves taking care of other older adults who are sick or have physical limitations.

A Lifetime of Experience to Share Like many other senior adults, Edna Warf of Asheville, North Carolina, drives great personal satisfaction from her work as a volunteer helping grade-school students. Contributing to their communities, taking care of others, and helping people both younger and older than themselves are important to many older adults.



Owen Franken/Corbis

FOCUS ON NEUROSCIENCE

Boosting the Aging Brain

Dozens of studies have shown that exercise, especially aerobic exercise, improves cognitive functioning in old age (Colcombe & Kramer, 2003; Hillman & others, 2008). Many studies have also shown that remaining mentally and physically active decreases age-related risks for cognitive impairment and Alzheimer's disease (Hertzog & others, 2009; Yaffe & others, 2009).

However, most human studies on brain structure have been *correlational,* rather than experimental, making it difficult to pin down causation. Does staying physically active improve cognitive functioning and brain health in old age? Or are people with better cognitive functioning and brain health more likely to stay physically active?

Psychologist Kirk Erickson and his colleagues (2011) set out to answer this question by designing an experiment to test whether aerobic exercise could improve brain health and cognitive functioning in older adults who were in good physical health but otherwise sedentary. And by sedentary, they meant *sedentary:* one requirement for participating in the study was that the participant had not been physically active for more than 30 minutes in the past six months.

The 120 participants, aged 55 to 80, were randomly assigned to two groups that met three times a week for a year. The *stretching and toning* group attended classes where they engaged in non-aerobic exercise, including muscle-toning exercises, resistance training, and yoga. This group also served as a control condition.

The *aerobic exercise group* started slowly. They began by walking around a track for just 10 minutes a session. Every week, the time spent walking was increased by just 5 minutes. By week 7, the participants were walking 40 minutes per session, three times a week.

What were the findings? After a year of regular exercise, *both* groups improved on measures of spatial memory, which is good news for those who engage in less-active exercise programs. It's also possible that all the participants benefited from the social interaction during their respective exercise classes.

Were there any structural effects on the elderly brains? Because of its involvement in memory (see chapter 6), researchers looked for changes in the *hippocampus.* The stretching and toning group showed, on average, a 1.4 percent decline in hippocampal volume over the one-year study period, which is about average for this age group.

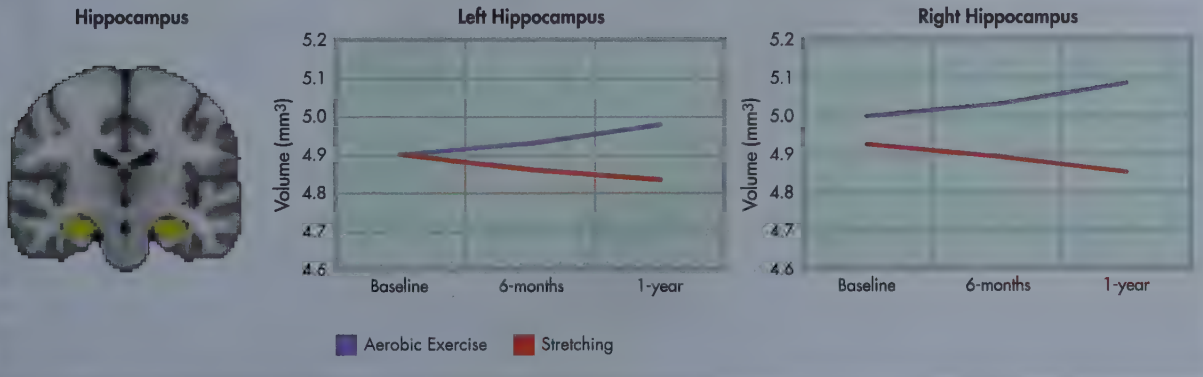


Mark Peterson/Redux

In contrast, participants in the aerobic exercise group *increased* the volume of their hippocampus by an average of 2 percent. Two percent may not sound like a large increase. However, because the hippocampus typically shrinks about 1–2 percent annually in older adults, a 2 percent gain is roughly equivalent to reversing two years of tissue loss.

This study is notable for several reasons. First, it showed that even in late adulthood, behavioral interventions can affect brain structure. Second, it showed that aerobic exercise is *neuroprotective*—it helps keep the brain healthy and may protect brain tissue from age-related deterioration. And third, it showed that a very moderate, simple exercise program can significantly improve cognitive abilities and brain health—even in late adulthood.

The bottom line: Declines in cognitive abilities and brain functions are neither inevitable nor unalterable (Voss & others, 2010). As Erickson (2011) points out, you don't have to be a highly conditioned athlete to reap the benefits of aerobic exercise. You don't need to join a gym, hire a trainer, or purchase expensive equipment. All you need is a good pair of shoes and a safe place to walk.



Effects of Aerobic Exercise on the Hippocampus in Late Adulthood After one year of regular aerobic exercise—simply walking three times a week—elderly participants (blue line) increased the size of their left and right hippocampus (brain region, highlighted in yellow) by an average of 2 percent. In contrast, the stretching-and-toning group (red line) showed about a 1.5 percent decline in the hippocampal volume, which is normal for this age group.

Along with satisfying social relationships, the prescription for psychological well-being in old age includes achieving what Erik Erikson called *ego integrity*—the feeling that one's life has been meaningful (Erikson & others, 1986). Older adults experience ego integrity when they look back on their lives and feel satisfied with their accomplishments, accepting whatever mistakes or missteps they may have made (Torges & others, 2008, 2009).

In contrast, those who are filled with regrets or bitterness about past mistakes, missed opportunities, or bad decisions experience *despair*—a deep sense of disappointment in life. Often the theme of ego integrity versus despair emerges as older adults engage in a *life review*, thinking about or retelling their life story to others (Bohlmeijer & others, 2007; Kunz & Soltys, 2007).

CONCEPT REVIEW 9.3

Adolescent and Adult Development

Mark each of the following statements as true or false. If a statement is false, write in the correct statement.

_____ 1. The development of both primary and secondary sex characteristics typically begins at an earlier age in girls than in boys.

_____ 2. Kohlberg found that most adolescents display stage 6 moral reasoning by age 17.

_____ 3. Women tend to experience much greater stress than men do in response to the demands of career, marriage, and family roles.

_____ 4. Younger parents adjust more easily to parenthood than older parents do.

_____ 5. After the last child leaves home, most couples suffer from the "empty-nest syndrome" and marital satisfaction declines significantly.

_____ 6. Moderate aerobic exercise can improve brain functioning and prevent age-related deterioration, but only until about age 55.



The Final Chapter

Dying and Death

KEY THEME

› Attitudes toward dying and death are as diverse in late adulthood as they are throughout the lifespan.

KEY QUESTIONS

› How did Kübler-Ross describe the stages of dying?

› What are some individual variations in attitudes toward death and dying?

It is tempting to view death as the special province of the very old. Of course, death can occur at any point during the lifespan. It's also tempting to assume that older adults have come to a special understanding about death—that they view the prospect of dying with wisdom and serenity. In reality, attitudes toward death in old age show the same diversity that is reflected in other aspects of adult development. Not all older adults are accepting of death, even when poor health has severely restricted their activities (Jun & others, 2010).

As psychologist Robert Kastenbaum (1992) wrote, "Everyone lives in relationship to death at every point in the lifespan." In other words, long before encountering old age, each individual has a personal history of thinking about death. Some people are obsessed with issues of life and death from adolescence or early adulthood onward, while others, even in advanced old age, take more of a one-day-at-a-time approach to living. And, feelings about and attitudes toward death are also influenced by cultural, philosophical, and religious beliefs (Gire, 2011; Rosenblatt, 2007).

In general, worries about death tend to peak in middle adulthood, then *decrease* in late adulthood (Neimeyer & others, 2004; Russac & others, 2007). At any age, people respond with a wide variety of emotions when faced with the prospect of imminent death, such as when they are diagnosed with a terminal illness.

The scientific study of death and dying owes much to pioneering psychiatrist Elisabeth Kübler-Ross (1926-2004). Based on interviews with hundreds of terminally ill patients,

Kübler-Ross (1969) proposed that the dying go through five stages. First, they *deny* that death is imminent, perhaps insisting that their doctors are wrong or denying the seriousness of their illness. Second, they feel and express *anger* that they are dying. Third, they *bargain*—they try to "make a deal" with doctors, relatives, or God, promising to behave in a certain way if only they may be allowed to live. Fourth, they become *depressed*. Finally, they *accept* their fate.

Although Kübler-Ross's research did much to sensitize the public and the medical community to the emotional experience of dying, it now seems clear that dying individuals do *not* necessarily progress through the predictable sequence of stages that she described (Kastenbaum, 2000, 2005).

Rather, dying is as individual a process as living. People cope with the prospect of dying much as they have coped with other stresses in their lives. Faced with impending death, some older adults react with passive resignation, others with bitterness and anger. Some people plunge into activity and focus their attention on external matters, such as making funeral arrangements, disposing of their property, or arranging for the care of other family members. And others turn inward, searching for the meaning of their life's story as the close of the final chapter draws near (Kastenbaum, 2000).

But even in dying, our life story doesn't just end. Each of us leaves behind a legacy of memories in the minds of those who survive us. As we live each day, we are building our legacy through our words, our actions, and the many choices we make along the way.

Each of us began life being completely dependent on others for our survival. Over the course of our lifespan, others come to depend on us. It is those people whose lives we have touched in some way, whether for good or for ill, who will remember us. In this sense, the final chapter of our lives will be written not by us, but by those whose life stories have intersected with our own.



SHNS photo by Pam Panchak/Pittsburgh Post-Gazette

The Last Lecture People vary greatly in how they cope with impending death. At the age of 45, Dr. Randy Pausch, a computer science professor at Carnegie Mellon University, learned that he had pancreatic cancer and was given just a few months to live. Pausch reacted by delivering his now famous "Last Lecture," written in response to the question, "What would you say if you knew you were going to die?" Titled *Really Achieving Your Childhood Dreams*, Pausch's lecture was upbeat, humorous, and inspirational, and has since been viewed by millions online. Pausch died about ten months after giving his speech, which you can view at http://www.cmu.edu/randyslecture/

CLOSING THOUGHTS

Traditionally, development in childhood has received the most attention from developmental psychologists. Yet, as we have emphasized throughout this chapter, development is a lifelong process.

Throughout this chapter, you've seen that every life is a unique combination of universal and individualized patterns of development. Although some aspects of development unfold in a predictable fashion, every life story, including yours, is influenced by unexpected events and plot twists. Despite predictable changes, the wonderful thing about the developmental process is that you never *really* know what the next chapter of your life story may hold.

authoritarian parenting style Parenting style in which parents are demanding and unresponsive toward their children's needs or wishes.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Raising Psychologically Healthy Children

Unfortunately, kids don't come with owners' manuals. Maybe that's why if you walk into any bookstore and head for the "parenting" section, you'll see shelves of books offering advice on topics ranging from "how to toilet-train your toddler" to "how to talk to your teenager." We're not going to attempt to cover that range here. However, we will present some basic principles of parenting that have been shown to foster the development of children who are psychologically well-adjusted, competent, and in control of their own behavior.

Basic Parenting Styles and Their Effects on Children

Psychologist Diana Baumrind (1971, 1991, 2005) has described three basic parenting styles: authoritarian, permissive, and authoritative. These parenting styles differ in terms of (1) parental control and (2) parental responsiveness to the child's needs and wishes.

Parents with an **authoritarian parenting style** are demanding but unresponsive to their children's needs or wishes. Authoritarian parents believe that they should shape and control the child's behavior so that it corresponds to an absolute set of standards. Put simply, they expect children to obey the rules, no questions asked. Rules are made without input from the child, and they are enforced by punishment, often physical.

At the opposite extreme are two **permissive parenting styles** (Maccoby & Martin, 1983). *Permissive-indulgent parents* are responsive, warm, and accepting of their children but impose few rules and rarely punish their children. *Permissive-indifferent parents* are both unresponsive and uncontrolling. Establishing firm rules and consistently enforcing them is simply too much trouble for permissive-indifferent parents. If taken to an extreme, the lack of involvement of permissive-indifferent parenting can amount to child neglect.

The third style is the **authoritative parenting style.** Authoritative parents are warm, responsive, and involved with their children. They set clear standards for mature, age-appropriate behavior and expect their children to be responsive to parental demands. However, authoritative parents also feel a *reciprocal* responsibility to consider their children's reasonable demands and points of view. Thus, there is considerable give-and-take between parent and child. Rules are firm and consistently enforced, but the parents discuss the reasons for the rules with the child.

How do these different parenting styles affect young children? Baumrind (1971) found that the children of authoritarian parents are likely to be moody, unhappy, fearful, withdrawn, unspontaneous, and irritable. The children of permissive parents tend to be more cheerful than the children of authoritarian parents, but they are more immature, impulsive, and aggressive. In contrast, the children of authoritative parents are likely to be cheerful, socially competent, energetic, and friendly. They show high levels of self-esteem, self-reliance, and self-control (Buri & others, 1988).

Decades of research has shown that parenting styles affect children's competence, adjustment, delinquent behavior, and self-esteem (Heaven & Ciarrochi, 2008; Simons and Conger, 2007). Consistently, research has shown that authoritative parenting is associated with higher grades, lower rates of delinquent behavior, and lower rates of substance abuse than authoritarian or permissive parenting (Grusec, 2011; Turner & others, 2009).

Why does an authoritative parenting style provide such clear advantages over other parenting styles? First, when children perceive their parents' requests as fair and reasonable, they are more likely to comply with the requests. Second, the children are more likely to *internalize* (or accept as their own) the reasons for behaving in a certain way and thus to achieve greater self-control (Martinez & Garcia, 2008).

In contrast, authoritarian parenting tends to promote rebellion and resentment. Because compliance is based on external control and punishment, children may not learn to control their own behavior (Gershoff, 2002). In a study that included participants from China, India, Italy, Kenya, Thailand, and Philippines, authoritarian parenting produced anxiety and aggression in children (Gershoff & others, 2010).

Finally, the child with permissive parents may never learn self-control. And because permissive parents have low expectations, the child may well live up to those expectations by failing to strive to fulfill his or her potential (Baumrind, 1971). However, there is some evidence that the permissive parenting style has benefits in some cultures, including countries in South America and Southern Europe (see Garcia & Gracia, 2009; Martinez & Garcia, 2008). So, it may be that the effectiveness of particular parenting styles, like many other aspects of development, are affected by culture.

How to Be an Authoritative Parent: Some Practical Suggestions

Authoritative parents are high in both responsiveness and control. How can you successfully achieve that balance? Here are several suggestions based on psychological research.

1. Let your children know that you love them.
Attention, hugs, and other demonstrations of physical affection, coupled with a positive attitude toward your child, are *some* of the most important aspects of parenting, aspects that have enduring effects (Steinberg, 2001). Children who experience warm, positive relationships with their parents are more likely to become happy adults with stable marriages and good relationships with friends (Hardy & others, 2010). So the question is simple: Have you hugged your kids today?

2. Listen to your children.
Let your children express their opinions, and respect their preferences when it's reasonable to do so. In making rules and decisions, ask for their input and give it genuine consideration. Strive to be fair and flexible, especially on issues that are less than earthshaking, such as which clothes they wear to school.

3. Use induction to teach as you discipline.
The most effective form of discipline is called **induction** because it *induces* understanding in the child. Induction combines controlling a child's behavior with *teaching* (Hoffman, 1977). Put simply, induction involves consistently explaining (a) the reason for prohibiting or performing certain behaviors; (b) the *consequences* of the action for the child; and (c) the *effect* of the child's behavior on others. When parents use induction, the child begins to understand that their actions are not completely arbitrary or unfair. The child is also more likely to internalize the reasoning and apply it in new situations (Kerr & others, 2004; Sorkhabi, 2010).

4. Work with your child's temperamental qualities.
Think back to our earlier discussion of temperamental qualities. Be aware of your child's natural temperament and work with it, not against it. If your child is very active, for example, it is unrealistic to expect him to sit quietly during a four-hour plane or bus trip. Knowing that, you can increase the likelihood of positive experiences by planning ahead. Bring coloring books, picture books, or small toys to occupy the young child in a restaurant or at a family gathering. Take frequent "exercise stops" on a long car trip. If your child is unusually sensitive, shy, or "slow-to-warm-up," give her plenty of time to make the transition to new situations and provide lots of preparation so that she knows what to expect.

5. Understand your child's age-related cognitive abilities and limitations.
Some parents make the mistake of assuming that children think in the same way adults do. They may see a toddler or even an infant as purposely "misbehaving," "being naughty," or "rebelling" when the little one is simply doing what 1-year-olds or 3-year-olds do. Your expectations for appropriate behavior should be geared to the child's age and developmental stage. Having a thorough understanding of the information in this chapter is a good start. You might also consider taking a developmental psychology or child development class. Or go to your college library and check out some of the developmental psychology texts. By understanding your child's cognitive abilities and limitations at each stage of development, you're less likely to misinterpret behavior or to place inappropriate demands on him.

- **permissive parenting style** Parenting style in which parents are extremely tolerant and not demanding; permissive-indulgent parents are responsive to their children, while permissive-indifferent parents are less.
- **authoritative parenting style** Parenting style in which parents set clear standards for their children's behavior but are also responsive to their children's needs and wishes.
- **induction** A discipline technique that combines parental control with explaining why a behavior is prohibited.

6. Don't expect perfection, and learn to go with the flow. Accidents happen. Mistakes occur. Children get cranky or grumpy, especially when they're tired or hungry. Don't get too bent out of shape when your child's behavior is less than perfect. Be patient. Moments of conflict with children are a natural, inevitable, and healthy part of growing up. Look at those moments as part of the process by which a child achieves autonomy and a sense of self.

Finally, effective parenting is an ongoing process in which you, as the parent, should be regularly assessing your impact on your child. It's not always easy to combine responsiveness with control, or flexibility with an appropriate level of firmness. When you make a mistake, admit it not just to yourself, but also to your child. In doing so, you'll teach your child how to behave when she makes a mistake. As you'll discover, children are remarkably forgiving—and also resilient.



CHAPTER REVIEW

Lifespan Development

KEY POINTS

Introduction: Your Life Story

- Developmental psychologists study the many ways in which people change over the lifespan. Key themes in **developmental psychology** include understanding the stages of lifespan development, the nature of change, and the interaction between heredity and environment.

Genetic Contributions to Your Life Story

- At conception, the union of the sperm and egg result in the single-celled **zygote.** The zygote contains genetic instructions inherited from the biological parents, encoded in the **chromosomes.** Chromosomes are made of **deoxyribonucleic acid (DNA).** Each chromosome has thousands of DNA segments called **genes,** which encode instructions for making a particular protein.
- An organism's unique **genotype** is found in almost every body cell. Cells differ not because they carry different genes but because they result from different genes being activated or expressed. Mapping of the human genome resulted in the discovery that humans have only 20,000–25,000 genes. Gene variations are called **alleles.** Some gene alleles are dominant or recessive. Most characteristics involve the interaction of multiple genes.
- The **phenotype** results from the interaction of genes and environmental factors. Different genotypes respond differently to the same environmental factors. **Epigenetics** is the study of the factors that control gene expression.

Prenatal Development

- During the nine months that make up the **prenatal stage,** the zygote develops into a full-term fetus. The prenatal stage includes the **germinal period,** the **embryonic period,** and the **fetal period. Stem cells** can divide indefinitely and give rise to other types of cells. The greatest vulnerability to **teratogens** occurs during the embryonic stage, when major bodily systems are forming.

Development During Infancy and Childhood

- Newborns are equipped with reflexes and sensory capabilities that enhance their chances for survival. Vision, hearing, and smell are attuned to interaction with caregivers. The brain develops rapidly after birth. The sequence of motor skill development is generally universal, although there is individual variation in the rate of development.
- Thomas and Chess demonstrated that infants seem to be born with different **temperaments.** They identified three basic temperamental patterns: easy, difficult, and slow-to-warm-up. According to Kagan, infants can be classified in terms of reactivity. Temperamental qualities seem to have a biological basis and persist through life, although they can be modified by environmental influences.
- According to **attachment** theory, the infant's ability to thrive is dependent on the quality of his or her attachment to caregivers. Secure attachment develops when parents are sensitive and responsive to the infant's needs. Insecure attachment may develop when parents are insensitive to the infant's needs.
- Infants are biologically predisposed to learn language. Adults encourage language development in infants by using motherese, also called parentese or infant-directed speech.
- The stages of language development include cooing, babbling, the one-word stage, and the two-word stage. At every stage, **comprehension vocabulary** is larger than **production vocabulary.**

Cognitive Development

- According to Jean Piaget's theory of cognitive development, children progress through distinct cognitive stages, each of which represents a shift in how they think and understand the world.
- **Object permanence** is acquired during the **sensorimotor** stage. **Symbolic thought** is acquired during the **preoperational stage.** Preoperational thought is **egocentric** and characterized by **irreversibility and centration.** Thus, the preoperational child is unable to grasp the principle of **conservation.** Children become capable of logical thought during the **concrete operational stage,** but thinking is limited to tangible objects and events. During the **formal operational stage,** the adolescent can engage in logical mental operations involving abstract concepts and hypothetical situations.
- Criticisms of Piaget's theory include the following: Piaget underestimated the cognitive abilities of infants and children; he underestimated the impact of the social and cultural

environment on cognitive development; and he overestimated the degree to which people achieve formal operational thought processes. In contrast to Piaget's theory, Vygotsky's idea of the **zone of proximal development** emphasizes that children can progress to higher cognitive levels through the assistance of others who are more competent.

- The **information-processing model** is a description of cognitive development that emphasizes basic mental processes and stresses that cognitive development is a process of continuous change.

Adolescence

- During **adolescence, puberty** occurs. Puberty involves the development of **primary** and **secondary sex characteristics,** the **adolescent growth spurt,** and, in females, **menarche.** While the sequence of pubertal changes is relatively predictable, the timing of puberty varies. Factors that affect the timing of puberty include gender, nutrition, body weight, family stress, and absence of the biological father.
- In general, when parent–child relationships are good before adolescence, they continue to be positive during adolescence. Relationships with peers become increasingly important. Peer influence is just as likely to be positive as negative. Romantic relationships can have a significant impact on the adolescent's psychological and social development.
- Erik Erikson's theory of psychosocial development stresses that every stage of life is marked by a particular psychosocial conflict. **Identity** versus role confusion is the conflict associated with adolescence; however, the process of identity formation does not end in adolescence.
- Lawrence Kohlberg described the types of **moral reasoning** used in making moral decisions. His theory of moral development includes the preconventional, conventional, and postconventional levels; each level has two stages. Other researchers study the role of emotion, culture, and gender in moral decision making.

Adult Development

- Although there are general patterns in adult development, individual variation becomes increasingly significant. The three phases of adulthood are early adulthood, middle adulthood, and late adulthood. Genetics, environment, and an individual's lifestyle all influence physical changes during adulthood and aging. Women experience **menopause** and men experience andropause during middle adulthood as the production of sex hormones declines in both sexes.
- Love and work are two key themes that dominate adult development. Friends continue to be important in adulthood. Forming a committed, intimate relationship is one important task traditionally associated with early adulthood.
- Marital satisfaction tends to decline after the first child is born and to increase after children leave home. Family structures and relationships have become increasingly diverse in the United States.

Late Adulthood and Aging

- Late adulthood does not necessarily involve a steep decline in physical and cognitive functioning. Mental abilities begin to decline slightly only at around age 60, and these declines can be minimized or eliminated with an active and mentally stimulating lifestyle.
- Many older adults do not disengage from life but remain socially active. According to the **activity theory of aging,** life satisfaction in late adulthood is highest when people maintain their previous levels of activity. Older adults differ in their optimal level of activity. Erikson identified ego integrity versus despair as the key psychosocial conflict of old age.

The Final Chapter: *Dying and Death*

- Although commonly associated with old age, death can occur at any point in the lifespan. Anxiety about death tends to peak in middle adulthood and decrease in late adulthood. Elisabeth Kübler-Ross proposed a five-stage model of dying: denial, anger, bargaining, depression, and acceptance. However, individuals respond in diverse ways to impending death.

KEY TERMS

developmental psychology, p. 360
zygote, p. 362
chromosome, p. 362
deoxyribonucleic acid (DNA), p. 362
gene, p. 362
genotype, p. 363
allele, p. 363
sex chromosomes, p. 363
phenotype, p. 363
epigenetics, p. 364
prenatal stage, p. 365
germinal period, p. 365
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teratogens, p. 365
stem cells, p. 366
fetal period, p. 367
temperament, p. 369
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comprehension vocabulary, p. 374
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sensorimotor stage, p. 377
object permanence, p. 377
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symbolic thought, p. 377
egocentrism, p. 378
irreversibility, p. 378
centration, p. 378
conservation, p. 379
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identity, p. 387
moral reasoning, p. 389
menopause, p. 392
activity theory of aging, p. 398
authoritarian parenting style, p. 401
permissive parenting style, p. 402
authoritative parenting style, p. 402
induction, p. 402

KEY PEOPLE

Mary D. Salter Ainsworth (1913–1999) American psychologist who devised the Strange Situation procedure to measure attachment; contributed to attachment theory. (p. 371)

Renée Baillargeon (b. 1954) Canadian-born psychologist whose studies of cognitive development during infancy using visual rather than manual tasks challenged beliefs about the age at which object permanence first appears. (p. 380)

Erik Erikson (1902–1994) German-born American psychoanalyst who proposed an influential theory of psychological development throughout the lifespan. (p. 388)

Lawrence Kohlberg (1927–1987) American psychologist who proposed an influential theory of moral development. (p. 389)

Jean Piaget (1896–1980) Swiss child psychologist whose influential theory proposed that children progress through distinct stages of cognitive development. (p. 376)

Lev Vygotsky (1896–1934) Russian psychologist who stressed the importance of social and cultural influences in cognitive development. (p. 381)

CONCEPT REVIEW ANSWERS

9.1 page 376

1. False. Human chromosomes contain thousands of genes.
2. False. Nearly all body cells contain the complete genotype in their nucleus; different types of cells develop because of differences in gene expression.
3. True
4. False. The brain continues to develop throughout the lifespan.
5. True
6. False. Sam would be classified as an "easy" baby.
7. True
8. False. Until about the age of 9 months, infants all over the world use the same sounds when they babble.

9.2 page 382

1. d 2. b 3. a 4. c

9.3 page 400

1. True
2. False. Kohlberg found that stage 6 moral reasoning was very rare, even among adults.
3. False. Rather than gender, the critical factor for both men and women is the quality of experiences in different roles.
4. False. Older parents tend to adjust more easily to parenthood than do younger parents.
5. False. Marital satisfaction typically increases after the last child leaves home.
6. False. Even in late adulthood, moderate aerobic exercise improves brain function and brain health.



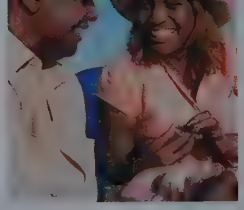
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CHAPTER 10

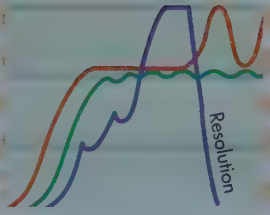
Gender and Sexuality











Soaring with Angels

PROLOGUE

RICHARD AND I HAD BEEN BEST FRIENDS since our paths first crossed at Central High School in Sioux City, Iowa. Even then, Richard was extraordinary. He was good-looking and liked by everyone. He maintained almost a straight-A average in his classes. In our senior year, he was elected student body president. (To be perfectly honest, he beat me in the race for student body president.) And his talent as a diver had attracted the attention of college swimming coaches. Coming from a family of very modest means, Richard hoped for an athletic scholarship to attend college. He got one: The University of Arkansas awarded him a four-year athletic scholarship.

Richard met Becky when they were freshmen at the University of Arkansas. They seemed like a good match. Becky was smart, pretty, athletic, and had a wonderful sense of humor. They were also both Catholic, which greatly pleased Becky's parents. So, it came as no surprise when Richard and Becky announced their plans to marry after graduating. But, in retrospect, I can't help thinking that Richard's timing was deliberate when he asked me, in front of Becky, to be his best man.

"You're *sure* you want to marry this guy?" I half-jokingly asked Becky.

"Only if he takes nationals on the three-meter board," Becky quipped. As it turned out, Richard did place third on the three-meter board the following spring at the national collegiate swimming competition.

Three months before their wedding, Richard and I had the only argument we've ever had. At the time we had the argument, the word *gay* meant lighthearted and cheerful, so the word never came up in our heated exchange.

"What do you mean, you haven't told her!?"

"I don't need to tell her about the past," Richard insisted.

"That's bull, Richard," I shouted. "This woman loves you and if you don't tell her about your homosexual urges, then you are marrying her under false pretenses."

"I do *not* have those feelings anymore!" Richard yelled back.

"If that's true, then tell her!" I demanded.

But it wasn't true, of course. Although Richard would not admit it to himself, he had only become adept at suppressing his sexual attraction to other men. At the time we had that argument, I was still the only person who knew that Richard harbored what he called "homosexual urges." Richard had first told me when we were juniors in high school. I was stunned. But Richard was also adamant that he did not want to feel the way he did. In fact, he felt ashamed and guilty. Back then, being homosexual carried a much greater social stigma than it does today.

IN THIS CHAPTER:

- Introduction: Gender and Sexuality
- Gender Stereotypes and Gender Roles
- Gender–Role Development: Blue Bears and Pink Bunnies
- Human Sexuality
- Sexual Behavior
- Sexual Disorders and Problems
- Closing Thoughts
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Men, Women, and Conflict: Bridging the Gender Gap

So when Richard and I were still in high school, we scraped up enough money to secretly send him to a psychologist for a few sessions. Despite our naive hopes for a quick "cure," Richard's troubling feelings remained. When he got to the University of Arkansas, Richard saw a counselor on a regular basis. After months of counseling, Richard believed he was capable of leading a heterosexual life.

Richard and Becky's wedding was magnificent. And, yes, I was the best man. After the wedding, they decided to stay in Fayetteville so that Richard could start graduate school. The inevitable happened less than a year later. Becky called me.

"I'm driving to Tulsa tonight. Don, you've *got* to tell me what's going on," she said, her voice strained, shaking. And I did, as gently as I could.

Richard and Becky's marriage was annulled. In time, Becky recovered psychologically, remarried, and had two children. Her bitterness toward Richard softened over the years. The last time we talked, she seemed genuinely forgiving of Richard.

For his part, Richard gave up trying to be something he was not. Instead, he came to grips with his sexual orientation, moved to San Francisco, and became a co-owner of two health clubs. True to form, Richard quickly became a respected and well-liked member of San Francisco's large gay community. He eventually met John, an accountant, with whom he formed a long-term relationship. But after Richard's move to San Francisco, our friendship faded.

It was our 20-year high school reunion that triggered Richard's unexpected call. When I told him I simply did not have the time to attend, he suggested stopping in Tulsa on his way to the reunion to meet Sandy and our daughter, Laura.

So on a warm May evening, Richard, Sandy, and I drank some margaritas, ate Chinese carryout, and talked until midnight. Just as I had expected, Sandy was quite taken with Richard. Indeed, Richard *was* a wonderful man—smart, funny, thoughtful, and sensitive. Laura, who was not quite 2 years old, was also enchanted by Richard. My only regret about that evening is that I did not take a picture of Richard sitting on our back deck as Laura brought him first one toy, then another, then another. As it turned out, it would be the last time I saw Richard.

About a year after he visited us in Tulsa, Richard was killed in a hang-gliding accident. As he was soaring over the rocky California coast, Richard swerved to miss an inexperienced flyer who crossed his path in the air. Richard lost control of his hang glider and was killed on impact when he plummeted into the rocky coastline.

A week later, more than 300 people crowded into St. Mary's Catholic Church in Sioux City, where Richard had been an altar boy in his youth. The outpouring of love and respect for Richard at the memorial service was a testament to the remarkable man he was.

What Richard's story illustrates is that who we are in this life—our identity—is not determined by any single characteristic or quality. Richard was gay, but that's not all Richard was, just as your sexual orientation is not the only characteristic that defines you. Nonetheless, Richard's story illustrates that sexual orientation and gender identity are potent forces that shape and direct each of our lives, including the relationships we form. In this chapter, we'll explore these topics in detail. In the process, we'll come back to Richard's story.



Introduction: Gender and Sexuality

KEY THEME

› Although the words are sometimes used interchangeably, *sex* refers to the biological aspects of being male and female, while *gender* refers to the psychological, social, and cultural aspects of masculinity and femininity.

KEY QUESTIONS

› What are gender roles?

› How do the terms gender identity and sexual orientation differ in meaning?

sex The biological category of male or female as defined by physical differences in genetic composition and in reproductive anatomy and function. (2) The behavioral manifestation of the sexual urge; sexual intercourse.

gender The cultural, social, and psychological meanings that are associated with masculinity or femininity.

gender roles The behaviors, attitudes, and personality traits that are designated as either masculine or feminine in a given culture.

sexual orientation The direction of a person's emotional and erotic attraction toward members of the opposite sex, the same sex, or both sexes.

gender-role stereotypes The beliefs and expectations people hold about the typical characteristics, preferences, and behavior of men and women.

As our description of Richard's life demonstrates, gender and sexuality are important components of everyone's personal destiny. As you read this chapter, we encourage you to think about how *your* life has been shaped by your sexual orientation and gender. Some of the information we present in this chapter may challenge your preconceptions about sexual attitudes and behavior. Certain topics related to gender and sexuality are controversial for some people. However, our primary goal in this chapter is to present research findings in an unbiased and evenhanded fashion.

Before we begin, we need to clarify terminology. The English language is less than precise in the arena of gender and sexuality. For example, the word *sex* can be used to describe an activity, as in the phrase "having sex." But the word *sex* is also used to indicate whether someone is biologically male or female. In this sense, the term sex refers to biologically determined physical characteristics, such as differences in genetic composition and reproductive anatomy and function (Pryzgoda & Chrisler, 2000).

In contrast, **gender** refers to the cultural, social, and psychological meanings that are associated with maleness and femaleness (Wood & Eagly, 2009). Think of "male" and "female" as designating the biological categories of *sex*, while "masculine" and "feminine" designate the social, cultural, and psychological categories of *gender*. As psychologists Rhoda Unger and Mary Crawford (1993) put it, "Gender is what culture makes out of the 'raw material' of biological sex."

Gender roles consist of the behaviors, attitudes, and personality traits that a given culture designates as either masculine or feminine. Gender identity refers to a person's psychological sense of self as male or female. Finally, **sexual orientation** refers to the *direction* of a person's emotional and erotic attraction, whether toward members of the opposite sex, the same sex, or both sexes.

By the time most people reach adulthood, both gender identity and sexual orientation are well established. Often without our awareness, our behaviors, attitudes, and aspirations have been strongly influenced by the gender-role expectations of our particular culture. But it's important to note that gender identity and sexual orientation can be independent of one another. For example, Richard's gender identity was very definitely male. He did not think of himself as anything but masculine. Nevertheless, his sexual orientation was toward other men rather than women.

In this chapter, we'll take a close look at the development and consequences of male and female gender roles. We'll also examine how sexuality develops. Later in the chapter, we'll consider some of the ways in which the expression of sexuality can become disrupted and psychologically troubling. In Enhancing Well-Being with Psychology, at the end of the chapter, we'll look at how gender differences can short-circuit attempts to resolve conflicts in intimate relationships, and we'll suggest ways to overcome these communication problems.



© Tomas Rodriguez

Life Themes: Gender and Sexuality From childhood to old age, gender identity and sexuality play an important role in our lives. How has your gender identity influenced the course of your life? The choices you've made? The relationships you've formed?

Gender Stereotypes and Gender Roles

KEY THEME

› Gender-role stereotypes are the beliefs and expectations that people hold about the characteristics and behaviors of each sex.

KEY QUESTIONS

› How do men and women compare in personality characteristics and cognitive abilities?

› How do men and women compare in terms of sexual attitudes and behaviors?

The beliefs people have about the typical characteristics and behaviors of each sex are referred to as **gender-role stereotypes.** In our culture, gender-role stereotypes for men and women are very different. Women are thought (and expected) to be more emotional, nurturing, and patient than are men. Men are thought (and expected) to be more aggressive, decisive, and mechanically minded than are women (Rudman & Glick, 2008). People often assume that gender stereotypes are derogatory toward women. In the United States, however, both men and women view the female gender-role stereotype more positively than the male gender-role stereotype (T. L. Lee & others, 2010). Still, psychologists Peter Glick and Susan Fiske (2003; 2001) argue that accepting positive stereotypes of women can produce a type of prejudice called *benevolent sexism*. While benevolent sexism is more socially acceptable than hostile sexism, it can contribute to gender inequality



U.S. Air Force photo by Senior Airman Jason Platek

How Accurate Are Gender-Role Stereotypes? Air Force Captain Kim Black has been flying B-1 Lancers for more than a decade. The only female pilot in her squadron, she has flown several combat missions in Afghanistan and Iraq. Once barred from all combat duty, U.S. women have been flying combat missions since the late 1990s and have piloted jets, including bombers and fighter planes, over Bosnia, Afghanistan, and Iraq. Although women are still barred from infantry and other land-based combat units, dozens of female soldiers have been killed by military attacks on the ground in Iraq. How does the active participation of women in the military violate traditional gender-role stereotypes?

TABLE 10.1

Gender Stereotypes Across Cultures

Characteristics Associated with Males			Characteristics Associated with Females		
Active	Dominant	Progressive	Affected	Emotional	Shy
Adventurous	Energetic	Robust	Affectionate	Fearful	Soft-hearted
Aggressive	Enterprising	Rude	Anxious	Feminine	Submissive
Ambitious	Forceful	Self-confident	Attractive	Fussy	Superstitious
Autocratic	Independent	Stern	Charming	Meek	Talkative
Coarse	Inventive	Strong	Complaining	Mild	Timid
Courageous	Logical	Tough	Curious	Sensitive	Weak
Cruel	Masculine	Unemotional	Dependent	Sexy	Whiny
Daring			Dreamy		

Source: Adapted from Williams & others (1999).

Psychologists John Williams (1999) and Deborah Best (2001) surveyed the characteristics commonly associated with men and women in 25 countries. Overall, characteristics associated with the male stereotype tended to be more active and stronger than the characteristics associated with the female stereotype.

(Sibley & Perry, 2010). As Glick and Fiske observe, "Characterizing women as pure creatures who ought to be protected, supported, and adored . . . implies that they are weak and best suited for conventional gender roles."

What about gender-role stereotypes in other cultures? In a survey of more than 25 cultures, psychologists John Williams (1999) and Deborah Best (2001) discovered a high degree of agreement on the characteristics associated with each sex (see Table 10.1). In general, the characteristics associated with males tended to be stronger and more active than the characteristics associated with females. In countries such as Japan, South Africa, and Nigeria, characteristics associated with the male stereotype were viewed more favorably than were characteristics associated with the female stereotype. However, the reverse was true in other countries, such as Italy, Peru, and Australia.

Gender-Related Differences

The *Opposite* Sex?

Are men and women radically different? It's a common theme in some self-help books, such as the series of books inspired by *Men Are from Mars, Women Are from Venus* (Gray, 1992).



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"Sex brought us together, but gender drove us apart."

When psychologists scientifically investigate the issue of gender differences, what do they find? *Are* men and women fundamentally different in *all* areas of their lives, as is often claimed in the popular media? Not really. In many aspects of behavior, including social, personality, and cognitive aspects, men and women are very similar (Hyde, 2007; Gerber, 2009; Guimond, 2008). And despite the claims of popular self-help books, men and women do not tend to *perceive* themselves as being diametrically opposite (Barnett & Hyde, 2001).

Nevertheless, there *are* some significant differences between the sexes, even beyond the obvious anatomical differences (Eagly & others, 2004; Wood & Eagly, 2010). However, many psychologists (including many of those who write textbooks) are reluctant to point out the gender differences that have been substantiated. Why? Basically, because some people are quick to equate a gender *difference* with a gender *deficiency.* For example, women's differences from men have historically been used to suggest that women are inferior to men (Moradi & others, 2010; Nutt, 2010). Not surprisingly, the gender-difference-equals-inferiority argument has also been used by some to suggest that men are inferior to women.

Beyond claims of inferiority, beliefs in gender differences have also been used to deny opportunities to one sex or the other. Here's an example. In the early 1970s, many people—including educators and politicians—believed that girls lacked the strength, stamina, or aggressiveness needed to participate in competitive sports. Girls just weren't suited to such activities, was the claim. In 1971, only *1 in 27* girls played high school sports. Today, almost 3 million girls—or *1 in every 2.5* girls—play on varsity high school sports teams (Women's Sports Foundation, 2005). Why the leap in sports participation? A major factor was the passage of Title IX, a federal law that forbids sex discrimination in educational programs, including athletics, by any institution receiving federal funds.

We've already noted some gender differences in previous chapters, such as male–female differences in friendship patterns (Chapter 9). But before we note other differences, two important qualifications need to be stressed. First, the differences between men and women are *average* differences, not absolute differences. As with other generalizations in psychology, no single finding will apply to *all* men and women. For example, consider the general finding that men tend to think about sex more often than do women (King & others, 2009; Tiegs & others, 2007). When you look at the actual data from one national survey in Figure 10.1, you quickly see that *some* women (19 percent) think about sex more often than almost half the male population. The point here is that for any given gender difference, there is a wide range of individual variation within each group. There is also quite a bit of overlap between the two groups.

Second, finding that a gender difference exists is one matter. Explaining what *caused* that difference is another matter altogether. For instance, consider the observation that women are more likely than men to wear earrings. This finding says nothing about the *cause* of that difference. Acknowledging that a gender difference exists does not automatically mean that such differences are "natural," "inevitable," or "unchangeable." Nor does it necessarily mean that the differences are biologically based.

Bearing these qualifications in mind, let's look at three areas of gender differences: personality, cognitive abilities, and sexual attitudes and behaviors. Although some differences do exist in these areas, men and women are more similar than they are different (Hyde, 2007).

Personality Differences

For *most* personality characteristics, there are *no* significant average differences between men and women. For example, women and men are, on average, very similar on such characteristics as impulsiveness and orderliness. However, men and women consistently differ on two personality dimensions. The first is that women tend to be more *nurturant* than men. The second is that men tend to be more *assertive* than women (Schmitt & others, 2008; Palomares, 2009).

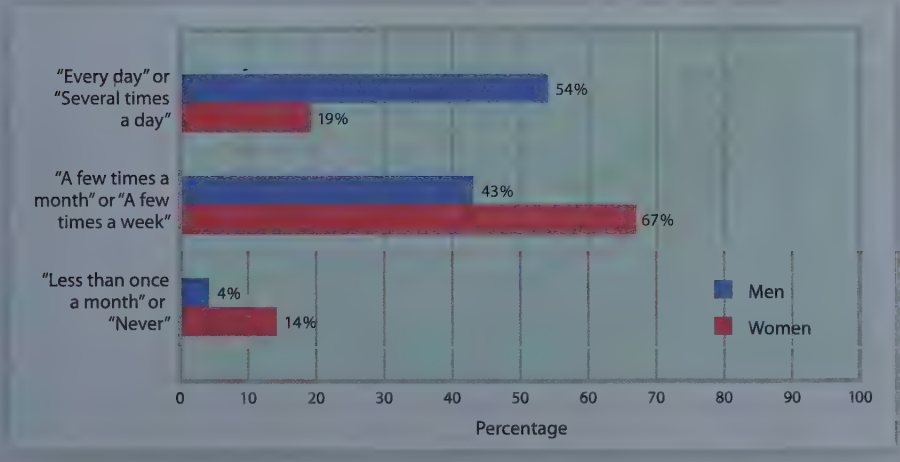


FIGURE 10.1 "How Often Do You Think About Sex?" The percentages shown here were derived from a national survey based on a random sample of American adults between the ages of 18 and 59. As you can see, although *most* men seem to think about sex more often than *most* women do, there is overlap between the sexes in this respect.

Source: Michael & others (1994).

Summarizing several studies, including cross-cultural research, psychologist Richard Lippa (2010) found that women tended to be more "people-oriented" and less "thing-oriented" than men. As psychologist Alice Eagly (1995a) observed, "In general, women tend to manifest behaviors that can be described as socially sensitive, friendly, and concerned with others' welfare, whereas men tend to manifest behaviors that can be described as dominant, controlling, and independent." Many people believe that women are much more emotional than men. We explore that issue in the Critical Thinking box.

Cognitive Differences

Is one sex smarter, more logical, or more creative than the other? No. For *most* cognitive abilities, there are *no* significant differences between males and females (Buss, 1995b; Hyde, 2007). However, once again, some limited differences do exist in this area (see Figure 10.2). Here are some of the best-substantiated gender-related cognitive differences.

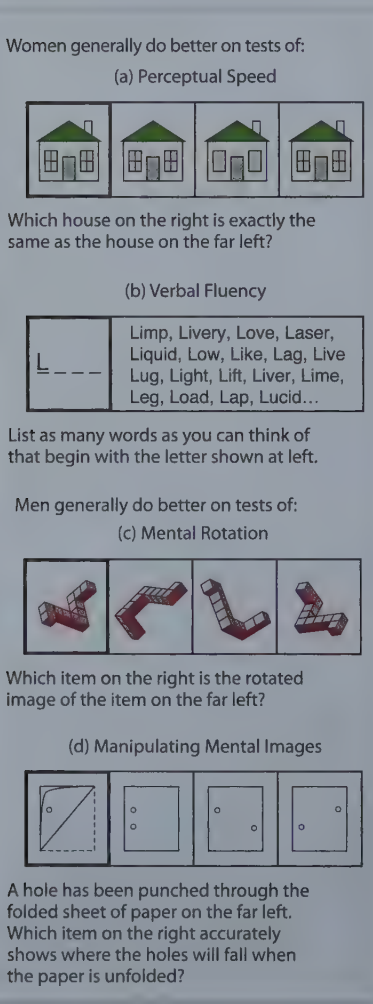
- **Verbal, reading, and writing skills.** Females consistently score much higher than males on tests of verbal fluency, reading comprehension, spelling, and, especially, basic writing skills (Lohman & Lakin, 2009). Although you rarely read about the "gender gap" in writing skills, females typically outperform males in this area.
- **Spatial skills.** Males outscore females on some, but not all, tests of spatial skills (Stancey & Turner, 2010). For example, males consistently outperform females on tests measuring the ability to mentally rotate three-dimensional figures (Jansen & Heil, 2010). On the other hand, women are significantly better than men at remembering the location of objects (Spiers & others, 2008; Voyer & others, 2007).
- **Math skills.** On *average*, males do slightly better than females on tests of advanced mathematical ability (see Halpern & others, 2007).

The difference in math skills deserves more comment. One widely believed stereotype is that males are much better than females at math (Schmader & others, 2004). However, over the last several decades, the so-called gender gap in mathematics has been steadily narrowing. Today, girls score just as highly as boys on national tests of math skills (Else-Quest & others, 2010). However, it is true that more males than females score in the very highest range in advanced math achievement tests (Lohman & Lakin, 2009; McGraw & others, 2006; Forgasz & others, 2010). One possible explanation is that very advanced mathematics draws heavily upon spatial abilities (Halpern & others, 2007).

Some researchers believe that cognitive differences between the sexes, such as the female advantage in verbal skills and the male advantage in spatial skills, are due to sex differences in brain function or organization. However, as we discussed in Chapter 2 (see page 74), male and female brains are, like male and female personality traits, far more similar than different (Halpern & others, 2007; Jordan-Young, 2010).

FIGURE 10.2 Sample Test Items Favoring Females or Males Women tend to outscore men on tests of verbal fluency, spelling, perceptual speed, and writing skills. Men, in contrast, tend to outscore women on some tests involving spatial skills, particularly mental rotation tasks.

Source: Kimura (1992).



Sexual Attitudes and Behaviors

Do men and women differ in their sexual attitudes, preferences, and behaviors? A recent meta-analysis of over 800 studies from 87 different countries investigated gender differences in sexuality (Petersen & Hyde, 2010). The meta-analysis found that men and women were similar on many dimensions. There were only small differences between men and women. However, men reported more permissive sexual attitudes than women, including much greater acceptance of casual sex. Men also tended to have more sexual partners than women and experienced their first intercourse at an earlier average age. The biggest difference was in the incidence of masturbation and use of pornography, with men reporting a higher incidence than women (Petersen & Hyde, 2010).

However, these results must be taken with a grain of salt. Some researchers have found that both men *and* women tend to be less than honest in their responses to questions about their sexual behaviors and attitudes (Alexander & Fisher, 2003).

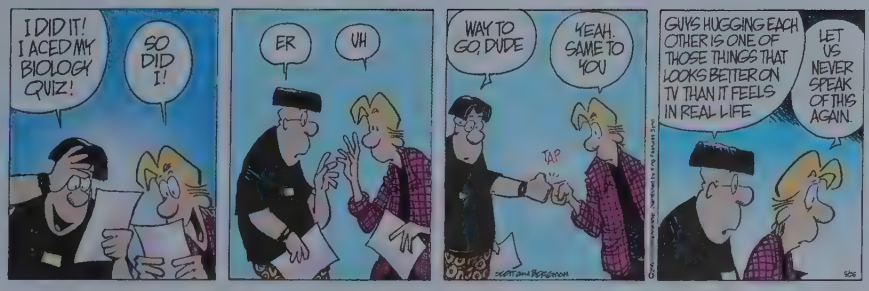
CRITICAL THINKING

Are Women *Really* More Emotional Than Men?

"You never talk about your feelings!!" *she* said in exasperation. "And you *never* stop talking about yours!!" *he* shot back, frowning. Is this scene familiar?

One of our culture's most pervasive gender stereotypes is that women express their emotions more frequently and intensely than men do. In contrast, men supposedly are calmer and possess greater emotional control (Vigil, 2009). Women, it's thought, cry easily. *Real* men don't cry at all.

ZITS



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Studies have shown that *both* men and women view women as the more emotional sex (Barrett & Bliss-Moreau, 2009). Women also place a higher value on emotional expressiveness than do men (Shields, 2002).

Women display more emotional awareness than men do (Boden & Berenbaum, 2007). Women are more accurate than men in deciphering the emotional meaning of nonverbal cues, such as facial expressions (Hall & Matsumoto, 2004; Hall & others, 2010). And, they tend to be more sensitive and responsive to the emotional exchanges in a relationship, often playing the role of the "emotion specialist." But do such widely held stereotypes reflect actual gender differences in emotional experience?

Consider a study by Ann Kring and Albert Gordon (1998), in which participants separately watched film clips that typically evoke happiness, fear, or sadness. For example, a fear-evoking film clip depicted a man almost falling off the ledge of a tall building. During the film, the participants' facial expressions were secretly videotaped from behind a one-way mirror. Galvanic skin response was also monitored as an index of physiological arousal. *Galvanic skin response* (GSR) measures the skin's electrical conductivity, which changes in response to sweating and increased blood flow. After the film clip, the participants rated the extent to which they experienced different emotions.

Kring and Gordon found that men and women did *not* differ in their self-ratings of the emotions they experienced in response to the film clips. However, the women *were* more emotionally expressive than men. Women displayed more positive facial expressions in response to happy film clips and more negative facial expressions in response to the sad or fearful scenes. In terms of physiological arousal, the sexes did *not* differ in their reactions to the happy or sad films. But when it came to the frightening film clips, the men reacted much more strongly than the women.

In a similar study, electrodes monitored facial muscle activity of male and female participants as they looked at fear-evoking pictures (Thunberg & Dimberg, 2000). Even though men and women rated the pictures as equally unpleasant, the women's facial muscles reacted much more strongly to the fearful images.

These and similar findings suggest that men and women are fairly similar in the *experience* of emotions, but that they do differ in the *expression* of emotions. How can we account for the gender differences in emotional expression?

First, psychologists have consistently found differences in the *types* of emotions expressed by men and women (see Shields, 2002). Analyzing cross-cultural data from 37 countries around the world, Agneta Fischer and her colleagues (2004) found this consistent pattern: Women report experiencing and expressing more sadness, fear, and guilt, while men report experiencing and expressing more anger and hostility.

Fischer and her colleagues (2004) argue that the male role encourages the expression of emotions that emphasize power and assertiveness. These *powerful emotions*—anger, hostility, and contempt—are emotions that confirm the person's autonomy and status. In contrast, the female role encourages the expression of emotions that imply self-blame, vulnerability, and helplessness. These *powerless emotions*—fear, sadness, shame, and guilt—are emotions that help maintain social harmony with others by minimizing conflict and hostility.

For both men and women, the expression of emotions is strongly influenced by *culturally determined display rules*, or societal norms of appropriate behavior in different situations. In many cultures, including the United States, women are allowed a wider range of emotional expressiveness and responsiveness than men. For men, it's considered "unmasculine" to be too open in expressing certain emotions. Crying is especially taboo (Warner & Shields, 2007). Thus, there are strong cultural and gender-role expectations concerning emotional expressiveness and sensitivity.

Like so many stereotypes, the gender stereotypes of emotions are not completely accurate. As psychologists Michael Robinson and Gerald Clore (2002) point out, men and women believe that their emotions differ far more than they actually do. Men and women differ less in their *experience* of emotion than they do in their *expression* of those emotions. However, women *are* the more emotional sex in terms of the ease with which they express their emotions, think about emotions, and recall emotional experiences (Feldman Barrett & others, 2000). In the Enhancing Well-Being with Psychology feature at the end of this chapter, we'll explore the implications of these gender differences for relationships.

CRITICAL THINKING QUESTIONS

- How are emotionally expressive males generally regarded in your social group? Emotionally expressive females? Does it make you uncomfortable when gender display rules are violated by either sex? Why?
- What kinds of consequences might occur if gender display rules were violated in a business environment? On a sports team? In a classroom?

Both sexes distort their responses to better match gender norms and expectations—although in opposite directions (Fisher, 2009). While women tend to downplay or minimize their sexual experiences, men tend to exaggerate theirs. In addition, some surveys have found fewer or *no* sex differences in terms of numbers of sexual partners, desired number of sexual partners, and actual sexual behavior, especially among college students (Paul & others, 2000; Pedersen & others, 2002).

So there you have it. On the whole, men and women are more similar than they are different. In the next section, we'll look at how each of us learns to identify ourselves as either male or female.

Gender-Role Development

Blue Bears and Pink Bunnies

KEY THEME

› Gender roles are the behaviors, attitudes, and traits that a given culture associates with masculinity and femininity.

KEY QUESTIONS

› What gender differences develop during childhood?

› How do social learning theory and gender schema theory explain gender-role development?



Image Source/Getty Images

Color-Coding and Gender
Little girls and little boys have a lot in common. Both of these children are clearly excited to be outside riding their mountain bikes. Nevertheless, the little boy's bike is blue, and the little girl's bike is pink. Why? Is there something "innate" about color preference? Vanessa LoBue and Judy DeLoache (2011) found that little girls don't acquire their preference for pink objects—and little boys their aversion for pink objects—until they are between the ages of two-and-a-half and three years old. That's also the age at which they are becoming aware of gender labels and their own gender identity, suggesting that their color preferences are shaped by social expectations.

Being male or female does make a vast difference in most societies. In the United States, newborn babies are often "color-coded" within moments of their birth. When our daughter was born, she was immediately wrapped in a pink blanket with bunnies, just like the other female infants in the nursery. The male infants were also color coded by gender—they had blue blankets with little bears. That, of course, is just the beginning (see Denny & Pittman, 2007). Many parents may try to raise their children in a "gender-neutral" fashion. However, research shows that even 1-year-olds are already sensitive to subtle gender differences in behavior and mannerisms (Poulin-Dubois & Serbin, 2006).

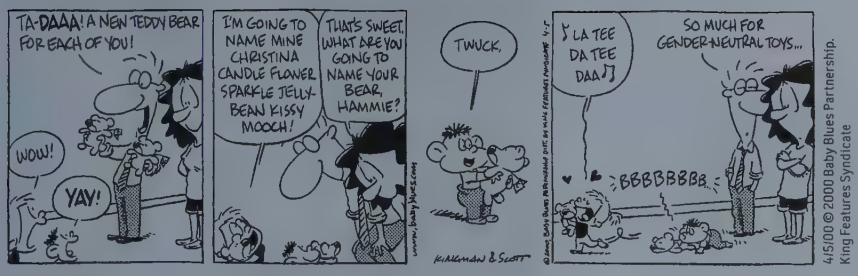
Gender Differences in Childhood Behavior

Batman Versus Barbie

Most toddlers begin using gender labels between the ages of 18 and 21 months (Zosuls & others, 2009). And, roughly between the ages of 2 and 3, children can identify themselves and other children as boys or girls, although the details are still a bit fuzzy to them (Zosuls & others, 2006). Preschoolers don't yet understand that sex is determined by physical characteristics. This is not surprising, considering that the biologically defining sex characteristics—the genitals—are hidden from view most of the time. Instead, young children identify the sexes in terms of external attributes, such as hairstyle, clothing, and activities.

From about the age of 18 months to the age of 2 years, sex differences in behavior begin to emerge (Miller & others, 2006). These differences become more pronounced throughout early childhood. Toddler girls play more with soft toys and dolls, and ask for help from adults more than toddler boys do. Toddler boys play more with blocks and transportation toys, such as trucks and wagons. They also play more actively than do girls (see Ruble & others, 2006).

BABY BLUES



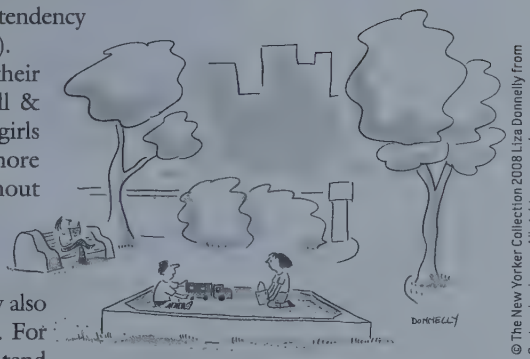
Roughly between the ages of 2 and 3, preschoolers start acquiring gender-role stereotypes for toys, clothing, household objects, games, and work. From the age of about 3 on, there are consistent gender differences in preferred toys and play activities. Boys play more with balls, blocks, and toy vehicles. Girls play more with dolls and domestic toys and engage in more dressing up and art activities. By the age of 3, children have developed a clear preference for toys that are associated with their own sex. This tendency continues throughout childhood (Berenbaum & others, 2008; Freeman, 2007).

Children also develop a strong preference for playing with members of their own sex—girls with girls and boys with boys (Egan & Perry, 2001; Fridell & others, 2006). It's not uncommon to hear boys refer to girls as "icky" and girls refer to boys as "mean" or "rough." And, in fact, preschool boys *do* play more roughly than girls, cover more territory, and play in larger groups. Throughout the remainder of childhood, boys and girls play primarily with members of their own sex (Hoffmann & Powlishta, 2001; Martin & Ruble, 2010).

According to psychologist Carole Beal (1994), boys and girls seem to almost create separate "social worlds," each with its own style of interaction. They also learn particular ways of interacting that work well with peers of the same sex. For example, boys learn to assert themselves within a group of male friends. Girls tend to establish very close bonds with one or two friends. Girls learn to maintain their close friendships through compromise, conciliation, and verbal conflict resolution.

Children are far more rigid than adults in their beliefs in gender-role stereotypes. Children's strong adherence to gender stereotypes may be a necessary step in developing a gender identity (Halim & Ruble, 2009). Boys are far more rigid than girls in their preferences for toys associated with their own sex. Their attitudes about the sexes are also more rigid than are those held by girls. As girls grow older, they become even more flexible in their views of sex-appropriate activities and attributes, but boys become even less flexible (Schmalz & Kerstetter, 2006).

Girls' more flexible attitude toward gender roles may reflect society's greater tolerance of girls who cross gender lines in attire and behavior. A girl who plays with boys, or who plays with boys' toys, may develop the grudging respect of both sexes. But a boy who plays with girls or with girls' toys may be ostracized by both sexes. Girls are often proud to be labeled a "tomboy," but for many boys, being called a "sissy" is still the ultimate insult (Thorne, 1993).



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"I don't see liking trucks as a boy thing. I see it as a liking-trucks thing."

Separate Worlds? In childhood, girls tend to establish close relationships with one or two other girls and to cement their friendships by sharing thoughts and feelings. In contrast, boys tend to play in groups and favor competitive games and team sports. How might such gender differences affect intimate relationships in adolescence and adulthood?



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Stuart Fax/ Getty Images/Gallo Images ROOTS

social learning theory of gender-role development The theory that gender roles are acquired through the basic processes of learning, including reinforcement, punishment, and modeling.

intersexed Condition in which a person's biological sex is ambiguous, often combining aspects of both male and female anatomy and/or physiology.

transgendered Condition in which a person's psychological gender identity conflicts with his or her biological sex.

transsexual A transgendered person who undergoes surgery and hormone treatments to physically transform his or her body into the opposite sex.

Are Males More Interested in Sports Than Females Are? Anyone who's watched a closely matched girls' high school basketball game can attest to the fact that girls can be just as competitive in sports as boys. Contrary to what some people think, there is no evidence to support the notion that girls are inherently less interested in sports than boys. During the middle childhood years, from ages 6 to 10, boys and girls are equally interested in sports (Women's Sports Foundation, 2007). Participating in sports enhances the self-esteem of girls as much as it does boys, especially during adolescence (Slutzky & Simpkins, 2009).



Larry Dale Gordon/Getty Images

As we've seen, there are very few significant differences between the sexes in either personality traits or intellectual abilities. Yet in many ways, children's behavior mirrors the gender-role stereotypes that are predominant in our culture.

Explaining Gender Roles

Two Contemporary Theories

Many theories have been proposed to explain the differing patterns of male and female behavior in our culture and in other cultures (see Reid & others, 2008). Gender theories have included findings and opinions from anthropology, sociology, neuroscience, medicine, philosophy, political science, economics, and religion. (Let's face it, you probably have a few opinions on the issue yourself.) We won't even attempt to cover the full range of ideas. Instead, we'll describe two of the most influential psychological theories: social learning theory and gender schema theory. In Chapter 11, on personality, we will discuss Freud's ideas on the development of gender roles.

Social Learning Theory

Learning Gender Roles

Children are gender detectives who search for cues about gender—who should or should not engage in a particular activity, who can play with whom, and why girls and boys are different. Cognitive perspectives on gender development assume that children are actively searching for ways to find meaning in and make sense of the social world that surrounds them, and they do so by using the gender cues provided by society to help them interpret what they see and hear.

Carol Lynn Martin and Diane Ruble (2004)

Based on the principles of learning, **social learning theory of gender-role development** contends that gender roles are learned through *reinforcement, punishment,* and *modeling* (Bussey & Bandura, 2004). According to this theory, from a very young age, children are reinforced or rewarded when they display gender-appropriate behavior and punished when they do not.

How do children acquire their understanding of gender norms? Children are exposed to many sources of information about gender roles, including television, video games, books, films, and observation of same-sex adult role models. Children also learn gender differences through *modeling*: They observe and then imitate the sex-typed behavior of significant adults and older children (Bronstein, 2006; Leaper & Friedman, 2007). By observing and imitating such models—whether it's Mom cooking, Dad fixing things around the house, or a male superhero rescuing a helpless female on television—children come to understand that certain activities and attributes are considered more appropriate for one sex than for the other (Martin & Ruble, 2010).

Gender Schema Theory

Constructing Gender Categories

Gender schema theory, developed by **Sandra Bem,** incorporates some aspects of social learning theory (Renk & others, 2006; Martin & others, 2004). However, Bem (1981) approached gender-role development from a more strongly cognitive

IN FOCUS

Beyond Male and Female: Variations in Gender Identity

As you will see throughout this chapter, while men and women are different, they are not polar opposites. Instead, there is a great deal of overlap between them. Rather than being black and white, personality and biological differences more often reflect shades of gray. But whether those shades of gray tend to be light or dark, most people develop a clear sense of gender identity as either male *or* female. And, for most people, their sense of gender identity is consistent with their physical anatomy.

But for a significant minority of people, gender identity and physical anatomy are not consistent. In some cases, biological factors blur the distinctions between male and female cells and body structures. During the course of prenatal development, chromosomal anomalies or atypical hormonal levels can affect the development of genitals or reproductive organs. The result is that there are other variations in gender identity beyond the typical categories of male or female.



AP Photo/Joel Page

Author Jennifer Finney Boylan James Finney Boylan was a successful novelist, college professor, and devoted husband and father. But after years of private anguish and turmoil, Boylan admitted the truth: She was a woman in a man's body. She tells her story in her memoir, *She's Not There: A Life in Two Genders* (2003). Her journey, she says, "is not the story of a husband who became a woman. This is the story of a woman who became herself."

Intersexed Individuals

An **intersexed** individual is someone whose biological sex is ambiguous (American Psychological Association, 2006). Reproductive structures may be partly male and partly female, tissues may be insensitive to the effects of hormones, or tissues may be exposed to hormone levels that are inconsistent with the person's genetic sex (Pasterski, 2008).

For example, girls with a syndrome called *congenital adrenal hyperplasia* are females who were exposed to abnormally high levels of testosterone during prenatal development, leading to genitals that may appear more masculine than feminine (Hines & others, 2004). Although these girls grow up to have a female gender identity, they often display masculine characteristics.

Conversely, genetic males (XY) with a syndrome called *androgen insensitivity syndrome* produce normal levels of androgens, but their body tissues are insensitive to the hormones' effects. These individuals have a small vagina, but no uterus, and undescended testes. Although they are genetic males, they are often labeled as girls because they don't have a penis.

In past years, most infants who were born with ambiguous genitals were surgically "corrected" so as to have the appearance of one sex or the other. In some cases, the gender labels imposed at birth eventually conflicted with the adolescents' developing gender identities.

Today, some intersex advocacy groups, such as the Intersex Society of North America (ISNA), oppose surgical and other interventions in infancy. The ISNA believes that the stigma associated with the condition is the biggest problem faced by intersex individuals (Chase, 2003, 2006). The ISNA recommends that parents and doctors should assign a gender to the newborn infant but should *not* perform irreversible surgery. Rather, surgery and hormone treatments, if needed, should be offered when the person is mature enough to provide informed consent—and after the intersexed individual's gender identity has been formed.

Transgendered Individuals

In contrast to intersexed individuals, **transgendered** individuals are anatomically "normal"—they are biologically male or female. However, their gender identity is in conflict with their biological sex (Sohn & Bosinski, 2007). A *transgendered woman* is an anatomical female who identifies with or wishes to become male. A *transgendered man* is an anatomical male who identifies with or wishes to become female.

Typically, the transgendered person has the strong feeling, often present since childhood, of having been born in the body of the wrong sex (Cohen-Kettenis & Pfafflin, 2010; Zucker & Cohen-Kettenis, 2008). They may be homosexual, heterosexual, or bisexual. Some transgendered individuals, who are often called **transsexuals,** choose to undergo sex reassignment, which involves hormone treatments and surgery to transform their physical body into the other sex (Laurence, 2008).

Is transsexualism a psychological disorder? When extreme discomfort with one's assigned gender causes significant psychological dysfunction, the diagnosis of *gender identity disorder* may be made (DSM-IV-TR, 2000). However, many professionals disagree with classifying gender-variant behaviors, attitudes, and feelings as a "disorder" (Hill & others, 2007; Isay, 2004; Cohen-Kettenis & Pfafflin, 2010).

Intersexed and transgendered individuals continue to face discrimination and prejudice in many aspects of their lives. Many intersexed individuals have the additional challenge of growing up in ignorance of their medical background. But some would argue that their lives are not all that different from those of people with a more conventional gender identity. In line with that thought, we'd like you to consider the words of Jim Costich (2003)—writer, activist, father, and self-identified gay intersexed man.

> We have achieved nothing if we are not free and supported by our own community to be exactly who we are, just as we are, without being expected to refashion our personalities, psyches, bodies and spirits into something others find more acceptable. Ultimately every single person is confined, conflicted, marginalized, and minimalized in some way by the arbitrary, unreasonable, and impossible artificial gender expectations of our society. This is no less true for heterosexuals than for [intersexed individuals]. Whenever we show them how parts of their story are like parts of our story, and vice versa, we knock another brick out of the gender wall.

gender schema theory The theory that gender-role development is influenced by the formation of schemas, or mental representations, of masculinity and femininity.

perspective. In contrast to the relatively passive role played by children in social learning theory, **gender schema theory** contends that children *actively* develop mental categories (or *schemas*) for masculinity and femininity (Martin & Ruble, 2004). That is, children actively organize information about other people and appropriate behavior, activities, and attributes into gender categories. Saying that "trucks are for boys and dolls are for girls" is an example of a gender schema. According to gender schema theory, children, like many adults, look at the world through "gender lenses" (Bem, 1987). Gender schemas influence how people pay attention to, perceive, interpret, and remember gender-relevant behavior. Gender schemas also seem to lead children to perceive members of their own sex more favorably than members of the opposite sex (Martin & others, 2002, 2004).

Like schemas in general (see Chapter 6), children's gender schemas do seem to influence what they notice and remember. For example, in a classic experiment, 5-year-olds were shown pictures of children engaged in activities that violated common gender stereotypes, such as girls playing with trucks and boys playing with dolls (Martin & Halverson, 1981, 1983). A few days later, the 5-year-olds "remembered" that the *boys* had been playing with the trucks and the *girls* with the dolls!



You've Come a Long Way, Baby?
Children's books continue to reinforce gender stereotypes, sometimes in subtle ways. In this picture book for preschoolers, a little girl follows her big brother's lead. The boy is shown actively digging in the mud, happily getting dirty with his dog, bat, and ball nearby. In contrast, the little girl, dressed in pink, stays clean as she feeds and nurtures her kitten.

From Goodnight, Sleep Tight? Shh... by Gyo Fujikawa. © 1990 by Fujikawa. Reprinted by permission of Random House, Inc

Children also readily assimilate new information into their existing gender schemas (Miller & others, 2006). In another classic study, 4- to 9-year-olds were given boxes of gender-neutral gadgets, such as hole punches (Bradbard & others, 1986). But some gadgets were labeled as "girl toys" and some as "boy toys." The boys played more with the "boy" gadgets, and the girls played more with the "girl" gadgets. A week later, the children easily remembered which gadgets went with each sex. They also remembered more information about the gadgets that were associated with their own sex. Simply labeling the objects as belonging to boys or to girls had powerful consequences for the children's behavior and memory—evidence of the importance of gender schemas in learning and remembering new information.

Gender schemas can be subtle. For example, a classic study by Beverly Fagot and her colleagues (1992) found that preschoolers tended to associate pictures of fierce-looking bears with males and fluffy cats with females. Similarly, children's toys, books, and other media often reinforce gender schemas. For example, a carefully designed study of almost 60 different children's coloring books found that gender stereotypes were widespread. Males were more likely to be depicted as animals, adults, and superheroes. Females, on the other hand, were more likely to be depicted as children and humans (Fitzpatrick & McPherson, 2010).

Given the gender-schematized world we grow up in, it's not surprising that gender stereotypes remain so pervasive and influential.

CONCEPT REVIEW 10.1

Aspects of Gender and Sexuality

Decide which term applies to each of the following examples. Choose from: gender schema theory, sex, gender-role stereotypes, social learning theory.

1. When James was born, the doctor saw his penis and said, "Mrs. McGillicuddy, it's a boy!" _____
2. Michael thinks that women are more patient and emotional than men and that men are more aggressive, logical, and rational than women. What do Michael's expectations reflect? _____
3. As a little boy, Brendan was scolded whenever he picked up a doll. But whenever he tried to throw a football to his father, his father beamed and praised him. As Brendan grew up, he ignored dolls and took every opportunity to get involved in sports. _____
4. When 4-year-old Nicole first met the 3-year-old twins, Tyler and Kimberly, Tyler was carrying a doll and Kimberly was wearing a toy tool belt. The next time Nicole saw Tyler, she asked, "Where's your tool belt?" _____

Human Sexuality

KEY THEME

› Multiple factors are involved in understanding human sexuality.

KEY QUESTIONS

› What are the four stages of human sexual response?
› How does sexual motivation differ among animal species?
› What biological factors are involved in sexual motivation?

Psychologists consider the drive to have sex a basic human motive. But what exactly motivates that drive? Obviously, there are differences between sex and other basic motives, such as hunger. Engaging in sexual intercourse is essential to the survival of the human species, but it is not essential to the survival of any specific person. In other words, you'll die if you don't eat, but you won't die if you don't have sex.



Richard Levine/Alamy

Obsessed with Sex? Sexual themes and images are often used to sell products, market movies, and boost TV ratings. How accurate are media images of human sexuality?

First Things First

The Stages of Human Sexual Response

The human sexual response cycle was first mapped by sex research pioneers **William Masters** and **Virginia Johnson** during the 1950s and 1960s. In the name of science, Masters and Johnson observed hundreds of people engage in more than 10,000 episodes of sexual activity in their laboratory. Their findings, published in 1966, indicated that the human sexual response could be described as a cycle with four stages.

As you read the descriptions of these stages, keep in mind that the transitions between stages are not as precise or abrupt as the descriptions might lead you to believe. Moreover, the duration of time spent in any particular stage can vary on different occasions of sexual interaction. Although it is simplified somewhat, Figure 10.3 on the next page depicts the basic patterns of sexual response for men and women.



TIME Magazine © 2006 Time Inc. Reprinted by permission.

Pioneers of Sex Research: William Masters (1915–2001) and Virginia Johnson (b. 1925) In 1966 Masters and Johnson broke new ground in the scientific study of sexual behavior when they published *Human Sexual Response*. In that book they provided the first extensive laboratory data on the anatomy and physiology of the male and female sexual response. Although intended for clinicians, the book became a best seller that was translated into over thirty languages. Some critics felt the Masters and Johnson research had violated "sacred ground" and dehumanized sexuality. But others applauded *Human Sexual Response* for advancing the understanding of human sexuality and dispelling misconceptions.

After opening a clinic for treatment of sexual problems, Masters and Johnson were featured on the cover of *Time* magazine in 1970. They also published *Human Sexual Inadequacy*, in which they described their innovative therapy techniques for treating sexual problems, including the use of male and female therapist teams to work with couples. The techniques they developed are still widely used in sex therapy today. Ultimately, Masters and Johnson promoted a view of human sexuality as a healthy and natural activity, one that could be a meaningful source of intimacy and fulfillment.

Stage 1: Excitement

The *excitement phase* marks the beginning of sexual arousal. Sexual arousal can occur in response to sexual fantasies or other sexually arousing stimuli, physical contact with another person, or masturbation. In both sexes, the excitement stage is accompanied by a variety of bodily changes in anticipation of sexual interaction. There is a rapid rise in pulse rate and blood pressure. The rate of breathing increases. Blood shifts to the genitals, producing an erect penis in the male and swelling of the clitoris in the female. The female's vaginal lips expand and open up, and her vagina becomes lubricated in preparation for intercourse. Her nipples and breasts may also become enlarged, and the nipples become erect and more sensitive.

Stage 2: Plateau

In the second phase, the *plateau phase*, physical arousal builds as pulse and breathing rates continue to increase. The penis becomes fully erect and sometimes secretes a few drops of fluid, which may contain active sperm. The testes increase in size. The clitoris withdraws under the clitoral hood but remains very sensitive to stimulation.

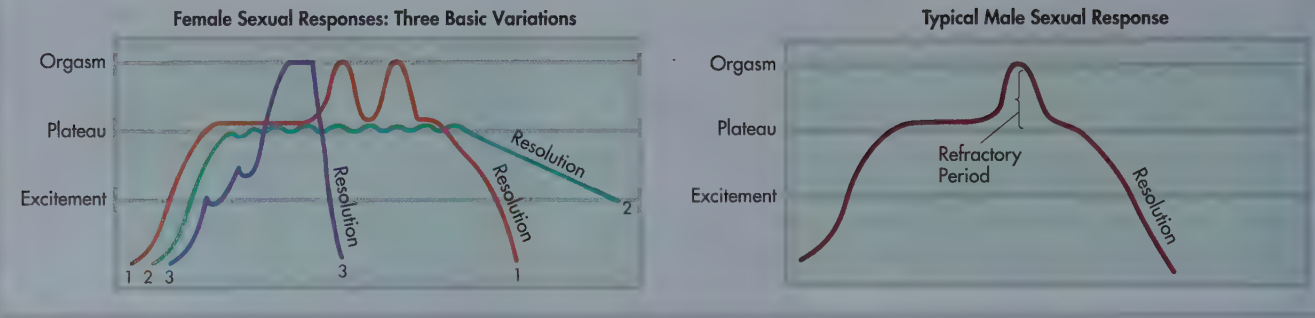


FIGURE 10.3 The Male and Female Sexual Response Cycles The figure on the left depicts the three basic variations of the female sexual response. Pattern 1 shows multiple orgasms. Pattern 2 shows sexual arousal that reaches the plateau stage but not orgasm, followed by a slow resolution. Pattern 3 depicts brief reductions in arousal during the excitement stage, followed by rapid orgasm and resolution. The figure on the right depicts the most typical male sexual response, in which orgasm is followed by a refractory period.

Source: Masters & Johnson (1966).

The vaginal entrance tightens, putting pressure on the penis during intercourse. Vaginal lubrication continues. During the excitement and plateau stages, the degree of arousal may fluctuate up and down (Masters & others, 1995). During the plateau stage, the firmness of the male's erection may increase and decrease, and so may the female's degree of vaginal lubrication.

Stage 3: Orgasm

Orgasm is the third and shortest phase of the sexual response cycle. During orgasm, blood pressure and heart rate reach their peak. The muscles in the vaginal walls and the uterus contract rhythmically, as do the muscles in and around the penis as the male ejaculates. Other muscles may contract as well, such as those in the face, arms, and legs. Both men and women describe the subjective experience of orgasm in similar—and very positive—terms.

The vast majority of men experience one intense orgasm. But many women are capable of experiencing multiple orgasms. If sexual stimulation continues following orgasm, women may experience additional orgasms within a short period of time (King & others, 2010).

Stage 4: Resolution

Following orgasm, both sexes tend to experience a warm physical "glow" and a sense of well-being. Arousal slowly subsides and returns to normal levels in the *resolution phase*. The male experiences a *refractory period,* during which he is incapable of having another erection or orgasm. The duration of the male's refractory period varies. For one man it may last a matter of minutes, for another several hours. As men age, the duration of the refractory period tends to increase.

What Motivates Sexual Behavior?

In most animals, sexual behavior is biologically determined and triggered by hormonal changes in the female. During the cyclical period known as *estrus,* a female animal is fertile and receptive to male sexual advances. Roughly translated, the Greek word *estrus* means "frantic desire." Indeed, the female animal will often actively signal her willingness to engage in sexual activity—as any owner of an unneutered female cat or dog that's "in heat" can testify. In many, but not all, species, sexual activity takes place only when the female is in estrus.

As you go up the evolutionary scale, moving from relatively simple to more sophisticated animals, sexual behavior becomes less biologically determined and more subject to learning and environmental influences. Sexual behavior also becomes less limited to the goal of reproduction (Buss, 2007a, 2007b). For example, in some primate species, such as monkeys and apes, sexual activity can occur at any time, not just when the female is fertile. In these species, sexual interaction serves important social functions, defining and cementing relationships among the members of the primate group.



Frans Lanting/Minden Pictures

The Bonobos of the Congo Bonobos demonstrate a wide variety of sexual interactions, including face-to-face copulation, kissing, and sexual interaction among same-sex pairs (Fruth & Hohmann, 2006; Parish & de Waal, 2000). Sexual behavior is not limited to reproduction; it seems to play an important role in maintaining peaceful relations among members of the bonobo group. As Frans de Waal (1995) wrote, "For these animals, sexual behavior is indistinguishable from social behavior."

One rare species of chimplike apes, the bonobos of the Democratic Republic of the Congo, exhibits a surprising variety of sexual behaviors (de Waal, 2007; Parish & de Waal, 2000). Although most animals *copulate,* or have sex, with the male mounting the female from behind, bonobos often copulate face to face. Bonobos also engage in oral sex and intense tongue kissing. And bonobos seem to like variety. Along with having frequent heterosexual activity, whether the female is fertile or not, bonobos also engage in homosexual and group sex.

Emory University psychology professor Frans de Waal (1995, 2007), who has extensively studied bonobos, observes that their frequent and varied sexual behavior seems to serve important social functions. Sexual behavior is not limited to fulfilling the purpose of reproduction. Among the bonobos, sexual interaction is used to increase group cohesion, avoid conflict, and decrease tension that might be caused by competition for food. According to de Waal (1995), the bonobos' motto seems to be "Make love, not war."

In humans, of course, sexual behavior is not limited to a female's fertile period (Buss, 2007). And, motives for sexual behavior are not limited to reproduction (Meston & Buss, 2007, 2009). Some women experience monthly fluctuations in sexual interest and motivation that are related to the hormonal cycles that also regulate fertility. However, these changes are highly influenced by social and psychological factors, such as relationship quality (Thornhill, 2007; Gangestad & others, 2007). Even when a woman's ovaries, which produce the female sex hormone *estrogen,* are surgically removed or stop functioning during menopause, there is little or no drop in sexual interest. In many nonhuman female mammals, however, removal of the ovaries results in a complete loss of interest in sexual activity. If injections of estrogen and other female sex hormones are given, the female animals' sexual interest returns.

In male animals, removal of the testes (castration) typically causes a steep drop in sexual activity and interest, although the decline is more gradual in sexually experienced animals. Castration causes a significant decrease in levels of *testosterone,* the hormone responsible for male sexual development. When human males experience lowered levels of testosterone because of illness or castration, a similar drop in sexual interest tends to occur, although the effects vary among individuals (Wrobel & Karasek, 2008). Some men continue to lead a normal sex life for years, but others quickly lose all interest in sexual activity. In castrated men who experience a loss of sexual interest, injections of testosterone restore the sexual drive.

Testosterone is also involved in female sexual motivation (Davis & others, 2008). Most of the testosterone in a woman's body is produced by her adrenal glands. If these glands are removed or malfunction, causing testosterone levels to become abnormally low, sexual interest often wanes. When supplemental testosterone is administered, the woman's sex drive returns. Thus, in *both* men and

women, sexual motivation is biologically influenced by the levels of the hormone testosterone in the body.

Of course, sexual behavior is greatly influenced by many different factors—social, cultural, and more. Could evolution have played a role? We discuss this question in the Culture and Human Behavior box, "Evolution and Mate Preferences."

CULTURE AND HUMAN BEHAVIOR

Evolution and Mate Preferences

Did the cartoon make you laugh—or at least smile? If it did, it's because you recognized a cultural pattern—the belief that men seek a beautiful, youthful partner, while women are more likely to value financial security and wealth. Cartoons and jokes aside, is there any merit to this observation? *Do* men and women differ in what they look for in a mate?

Bizarro



To investigate mate preferences, psychologist David Buss (1994, 2009) coordinated a large-scale survey of more than 10,000 people in 37 different cultures. Across all cultures, Buss found, men were more likely than women to value youth and physical attractiveness in a potential mate. In contrast, women were more likely than men to value financial security, access to material resources, high status and education, and good financial prospects. Buss, an evolutionary psychologist, interprets these gender differences as reflecting the different "mating strategies" of men and women.

According to evolutionary psychology, mating behavior is adaptive to the degree that it furthers the reproductive success of transmitting one's genes to the next generation and beyond. And when it comes to reproductive success, Buss (1995a, 2009, 2011) contends that men and women face very different "adaptive problems" in selecting a mate.

According to Buss (1995b, 1996), the adaptive problem for men is to identify and mate with women who are fertile and likely to be successful at bearing their children. Thus, men are more likely to place a high value on youth, because it is associated with fertility and because younger women have a greater number of childbearing years ahead of them than older women. And, men value physical attractiveness because it signals that the woman is probably physically healthy and has high-quality genes.

Buss (2011) sees the adaptive problem for women as very different. Women also seek "good" genes, and thus they value men who are healthy and attractive. But they have a more pressing need: making sure that the children they do bear survive to carry their genes into future generations. Pregnancy, lactation, and caring for infants, says Buss, leave women unable to acquire the resources needed to protect and feed themselves and their children. Thus, women look for a mate who will be a "good provider." They seek men who possess the resources that the women and their offspring will need to survive.

In most cultures, Buss (2009, 2011) points out, men of high status and wealth are more able to marry younger and more attractive women than poor, low-status men are. In other words, older, successful men, whether they are tribal chiefs, corporate CEOs, or aging rock superstars, have the greatest access to young, attractive women—the so-called "trophy wife." On the flip side, physically attractive women can, and often do, marry men with more resources and higher status than do unattractive women.

However, Buss (2011) along with many other psychologists have noted that even this general pattern of mate preferences is influenced by many cultural and social factors. For example, women who live in cultures where they have less reproductive freedom and fewer educational opportunities tend to place a higher value on a prospective mate's resources (Kasser & Sharma, 1999). Similarly, valued attributes reflect socioeconomic development. Health is more highly valued in less developed countries, and love is more highly valued in developed countries (Stone & others, 2008).

The evolutionary explanation of sex differences is controversial (Confer & others, 2010). Some psychologists argue that it is overly deterministic and does not sufficiently acknowledge the role of culture, gender-role socialization, and other social factors (Eagly & Wood, 2011; Pedersen & others, 2010).

For his part, Buss (2011) has always been careful to point out that this theory does *not* claim that personal preferences have no effect on mate preferences. In fact, his extensive survey also found that men and women in all 37 cultures agreed that the *most* important factor in choosing a mate was mutual attraction and love. And, here's a finding that will probably be reassuring to those singles who have neither fabulous wealth nor heart-stopping beauty: Both sexes rated kindness, intelligence, emotional stability, health, and a pleasing personality as more important than a prospective mate's financial resources or good looks.

Finally, evolutionary psychologists reject the idea that people, cultures, or societies are powerless to overcome tendencies that evolved over hundreds of thousands of years (Buss & Schmitt, 2011). Buss also flatly states that explaining some of the reasons that might underlie sexual inequality does *not* mean that sexual inequality is natural, correct, or justified. Rather, evolutionary psychologists believe that we must understand the conditions that foster sexual inequality in order to overcome or change those conditions (Buss & Schmitt, 2011).

Sexual Orientation

The Elusive Search for an Explanation

KEY THEME

› Sexual orientation refers to whether a person is attracted to members of the opposite sex, the same sex, or both sexes.

KEY QUESTIONS

› Why is sexual orientation sometimes difficult to identify?

› What factors have been associated with sexual orientation?

sexual orientation The direction of a person's emotional and erotic attraction toward members of the opposite sex, the same sex, or both sexes.

Given that biological factors seem to play an important role in motivating sexual desire, it seems only reasonable to ask whether biological factors also play a role in sexual orientation. **Sexual orientation** refers to whether a person is sexually aroused by members of the same sex, the opposite sex, or both sexes. A *heterosexual* person is sexually attracted to individuals of the other sex, a *homosexual* person to individuals of the same sex, and a *bisexual* person to individuals of both sexes. Technically, the term *homosexual* can be applied to either males or females. However, female homosexuals are usually called *lesbians*. Male homosexuals typically use the term *gay* to describe their sexual orientation.

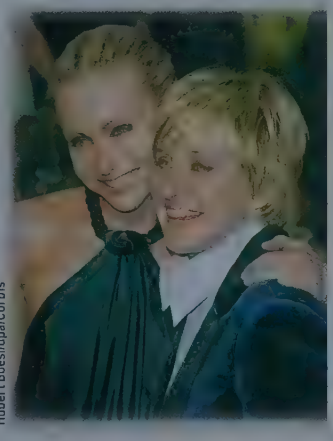
Sexual orientation is not nearly as cut and dried as many people believe. Some people *are* exclusively heterosexual or homosexual, but others are less easy to categorize. Many people who consider themselves heterosexual have had a homosexual experience at some point in their lives. In the same vein, many homosexuals have had heterosexual experiences (Malcolm, 2008; Rieger & others, 2005). Other people, like our friend Richard in the chapter Prologue, consider themselves to be homosexual but have been involved in long-term, committed heterosexual relationships. The key point is that there is not always a perfect correspondence between a particular person's sexual identity, sexual desires, and sexual behaviors.

Determining the number of people who are homosexual or heterosexual is challenging. First, survey results vary depending on how the researchers define the terms *homosexual, heterosexual,* and *bisexual* (Savin-Williams & Hope, 2009). Where the survey is conducted, how survey participants are selected, and how the survey questions are worded also affect the results.

Depending upon how sexual orientation is defined, estimates of the prevalence rate of homosexuality in the general population ranges from 1 percent to 21 percent (Savin-Williams, 2006). More important than the exact number of gays and lesbians is the recognition that gays and lesbians constitute a significant segment of the adult population in the United States. According to the most recent estimates, about 7% of women and 5% of men report having ever engaged in homosexual behavior (F. Xu & others, 2010a, 2010b).



AP Photo/Hadyn West



Hubert Boesl/dpa/Corbis

Famous Gay Couples Legendary singer, songwriter, and musician Elton John spent years claiming to be bisexual, even marrying German sound engineer Renata Blauel in 1984. But when that marriage ended four years later, Elton admitted publicly what he said he had known privately for years—that he was gay. Since 1993, John's companion has been Canadian film producer David Furnish. In the photo, John and Furnish are shown leaving Guildhall in Windsor, England, after their civil partnership ceremony on December 21, 2005. "We love each other just as much as any other two human beings love each other," John (2005) explained. "In the twenty-first century, tolerance should be something that we promote a little more."

Comedian and popular talk show host Ellen DeGeneres struggled for many years to come to grips with her sexual orientation before publicly coming out as a lesbian. As DeGeneres (2005) recalled, "To be 37 years old and be feeling this sense of shame, that nobody would like me if they found out I was gay, it was a pretty emotional thing to expose yourself to." In 1997, she made television history when she "outed" herself and her character in her television series *Ellen*. Although Ellen's first public relationship with Anne Heche created something of a media frenzy, her marriage to long-time companion Portia deRossi in August, 2008, a few months after same-sex marriage became legal in California, was covered like any other celebrity wedding ceremony.



AP Photo/Ron Edmonds

U.S. Congressman Barney Frank: "You Can't Make Yourself a Different Person." One of the first openly gay politicians, Frank has been a member of the U.S. Congress since 1981. Frank first realized he was gay in his early teenage years. When asked if heterosexuality was ever an option for him, Frank (1996) responded, "I wished it was. But it wasn't. I can't imagine that anybody believes that a 13-year-old in 1953 thinks, 'Boy, it would really be great to be part of this minority that everybody hates and to have a really restricted life.' You can't make yourself a different person. I am who I am. I have no idea why."

I heard this on the news: "For every older brother a man has, the chances of him being gay increase by one-third." I got a few problems with this theory. Specifically, Jimmy, Eddie, Billy, Tommy, Jay, Paul, and Peter. Those are my older brothers—seven brothers. By their math, I should be 233 percent gay. That's getting up there.

Stephen Colbert—The Colbert Report

What Determines Sexual Orientation?

Despite considerable research on this question, psychologists and other researchers cannot say with certainty why people become homosexual or bisexual. For that matter, psychologists don't know exactly why people become *heterosexual* either. Still, research on sexual orientation has pointed toward several general conclusions, especially with regard to homosexuality.

Evidence from multiple studies shows that genetics plays a role in determining sexual orientation (Rodriguez-Larralde & Paradisi, 2009). Most studies compare the incidence of homosexuality among pairs of identical twins (who have identical genes), fraternal twins (who are genetically as similar as any two nontwin siblings), and nontwin siblings. In both males and females, research has shown that the closer the degree of genetic relationship, the more likely it was that when one sibling was homosexual, the other would also be homosexual. Such studies have shown that genetics contributes to homosexual orientation in both men and women, although to a much lesser degree in women than men (Alanko & others, 2010; Långström & others, 2010).

However, genetics is only a partial explanation. In the largest twin studies to date, Swedish researchers showed that *both* genetic and nonshared environmental factors were involved in sexual orientation (Långström & others, 2008, 2010). What are "nonshared" environmental factors? Influences that are experienced by one, but not both, twins. More specifically, these are social and biological factors, rather than upbringing or family environment.

Clearly, sexual orientation is at least partly influenced by genetics (Hyde, 2005). However, that genetic influence is likely to be complex, involving the interaction of multiple genes, not a single "gay gene" (see Vilain, 2008). Beyond heredity, there is also evidence that sexual orientation may be influenced by other biological factors, such as prenatal exposure to sex hormones or other aspects of the prenatal environment (Hines, 2010).

For example, one intriguing finding is that the more older brothers a man has, the more likely he is to be homosexual (Blanchard, 2008; Blanchard & Lippa, 2008). Could a homosexual orientation be due to psychological factors, such as younger brothers being bullied or indulged by older male siblings? Or being treated differently by their parents, or some other family dynamic?

No. Collecting data on men who grew up in adoptive or blended families, Anthony Bogaert (2006) found that only the number of biologically related older brothers predicted homosexual orientation. Living with older brothers who were *not* biologically related had no effect at all. As Anthony Bogaert (2007) explains, "It's not the brothers you lived with; it's the environment within the same womb—sharing the same mom." Researchers don't have an explanation for the effect, which has been replicated in multiple studies (see Bogaert, 2007). One suggestion is that carrying successive male children might trigger some sort of immune response in the mother that, in turn, influences brain development in the male fetus (James, 2006).

Finally, a number of researchers have discovered differences in brain function or structure among gay, lesbian, and heterosexual men and women (e.g., LeVay, 2007; Savic & Lindström, 2008). However, most of these studies have proved small or inconclusive. It's also important to note that there is no way of knowing whether brain differences are the *cause* or the *effect* of different patterns of sexual behavior.

In general, the only conclusion we can draw from these studies is that some biological factors are *correlated* with a homosexual orientation (Mustanski & others, 2002). As we've stressed, correlation does not necessarily indicate causality, only that two factors *seem* to occur together. So stronger conclusions about the role of genetic and biological factors in determining sexual orientation await more definitive research findings.

In an early study involving in-depth interviews with over 1,000 gay men and lesbian women, Alan Bell and his colleagues (1981) found that homosexuality was *not* the result of disturbed or abnormal family relationships. They also found that sexual orientation was determined before adolescence and long before the beginning of sexual activity. Gay men and lesbian women typically became aware of homosexual feelings

about three years before they engaged in any such sexual activity. In this regard, the pattern was very similar to that of heterosexual children, in whom heterosexual feelings are aroused long before the child expresses them in some form of sexual behavior.

Several researchers now believe that sexual orientation is established as early as age 6 (Strickland, 1995). Do children who later grow up to be homosexuals differ from children who later grow up to be heterosexuals? In at least one respect, there seems to be a difference.

Typically, boys and girls differ in their choice of toys, playmates, and activities from early childhood. However, evidence suggests that male and female homosexuals are less likely to have followed the typical pattern of gender-specific behaviors in childhood (Bailey & others, 2000; Lippa, 2008; Rieger & others, 2008). Compared to heterosexual men, gay men recall engaging in more cross-sex-typed behavior during childhood. For example, they remembered playing more with girls than with other boys, preferring girls' toys over boys' toys, and disliking rough-and-tumble play. Lesbians are also more likely to recall cross-gender behavior in childhood. One study suggests that lesbians show an even greater degree of gender nonconformity than gays (Lippa, 2008).

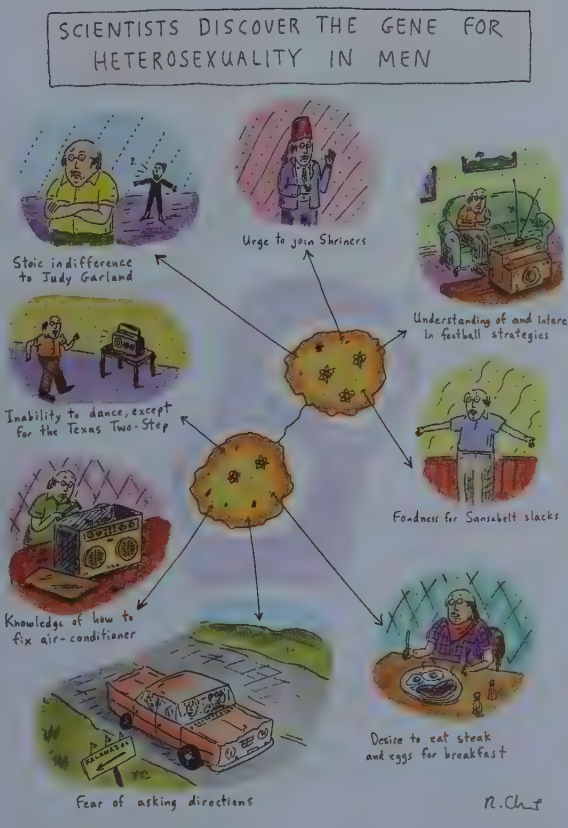
A potential problem with such *retrospective studies* is that the participants may be biased in their recall of childhood events. One way to avoid that problem is by conducting a prospective study. A *prospective study* involves systematically observing a group of people over time to discover what factors are associated with the development of a particular trait, characteristic, or behavior.

One influential prospective study was conducted by Richard Green (1985, 1987). Green followed the development of sexual orientation in two groups of boys. The first group of boys had been referred to a mental health clinic because of their "feminine" behavior. He compared the development of these boys to a matched control group of boys who displayed typically "masculine" behavior in childhood. When all the boys were in their late teens, Green compared the two groups. He found that approximately 75 percent of the previously feminine boys were either bisexual or homosexual, as compared to only 4 percent of the control group.

Less is known about girls who are referred to clinics because of cross-gender behavior, partly because girls are less likely to be referred to clinics for "tomboy" behavior (Zucker & Cohen-Kettenis, 2008). However, Kelley Drummond and her colleagues (2008) found that cross-gender behavior in girls was also associated with the later development of bisexual or homosexual orientation, although at a lower rate than was true for boys.

Once sexual orientation is established, whether heterosexual or homosexual, it is highly resistant to change (Drescher & Zucker, 2006). The vast majority of homosexuals would be unable to change their orientation even if they wished to, just as the majority of heterosexuals would be unable to change their orientation if *they* wished to. Thus, it's a mistake to assume that homosexuals have deliberately chosen their sexual orientation any more than heterosexuals have. Indeed, when Richard was in high school, he would gladly have "chosen" to be heterosexual if the matter had been that simple.

It seems clear that no single factor determines whether people identify themselves as homosexual, heterosexual, or bisexual (Patterson, 2008). Psychological, biological, social, and cultural factors are undoubtedly involved in determining sexual orientation. However, researchers are still unable to pinpoint exactly what those factors are and how they interact. As psychologist Bonnie Strickland (1995) has pointed out, "Sexual identity and orientation appear to be shaped by a complexity of biological, psychological, and social events. Gender identity and sexual orientation, at least for most people, especially gay men, occur early, are relatively fixed, and are difficult to change." As Richard learned, changing his sexual orientation was simply not possible.



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Same-Sex Couples and Their Children

Research on same-sex couples in committed, long-term relationships shows that their relationships are quite similar to those of heterosexual couples in most ways (Balsam & others, 2008). One exception: Lesbian couples were better than heterosexual or gay couples at harmonious problem-solving (Roisman & others, 2008). What about their children? Research consistently has shown that the children of same-sex parents are very similar to the children of heterosexual parents (Patterson, 2006, 2008). And, contrary to popular belief, teenagers with same-sex parents have peer relationships and friendships that are much like those of teenagers with heterosexual or single parents (Wainwright & Patterson, 2008; Rivers & others, 2008).



Yana Paskova for The New York Times

Homosexuality is no longer considered a sexual disorder by clinical psychologists or psychiatrists (American Psychiatric Association, 1994; Silverstein, 2009). Many research studies have also found that homosexuals who are comfortable with their sexual orientation are just as well adjusted as are heterosexuals (see Strickland, 1995).

Like heterosexuals, gays and lesbians can be found in every occupation and at every socioeconomic level in our society. And, like heterosexuals, many gays and lesbians are involved in long-term, committed, and caring relationships (Roisman & others, 2008). Children who are raised by gay or lesbian parents are as well adjusted as children who are raised by heterosexual parents (Patterson, 2006; Wainwright & Patterson, 2008). Finally, children who are raised by gay or lesbian parents are no more likely to be gay or lesbian in adulthood than are children who are raised by heterosexual parents (Bailey & others, 1995; Anderssen & others, 2002). Over 25 years of research suggests that children of gay and lesbian parents are at least as well adjusted as children of other parents (Patterson, 2009; Telingator & Patterson, 2008).

CONCEPT REVIEW 10.2

Elements of Human Sexuality and Sexual Orientation

1. Justin is a 24-year-old heterosexual. His 20-year-old brother, Max, is homosexual. The brothers differ in their
   a. gender roles
   b. gender identity
   c. sexual orientation
   d. gender schemas

2. According to Masters and Johnson, the stages of the sexual response cycle are
   a. plateau, excitement, and resolution in women and excitement, ejaculation, and resolution in men
   b. arousal, orgasm, and resolution, although the sequence can vary from one person or situation to another
   c. excitement, plateau, orgasm, and resolution in both men and women
   d. a buildup and release of testosterone in men and a similar buildup and release of estrogen in women

3. Males but not females experience _____ after orgasm.
   a. a refractory period
   b. a surge of testosterone
   c. a brief period of unconsciousness
   d. amnesia

4. Which of the following statements accurately summarizes the research findings concerning biological factors and homosexuality?
   a. Biological differences in the hypothalamus cause homosexuality
   b. Sexual orientation is completely determined by genetics
   c. Homosexuality is caused by insufficient amounts of testosterone
   d. Some biological factors are correlated with homosexual orientation

Sexual Behavior

KEY THEME

› Intimate, committed relationships are typically established during early adulthood, but they remain important throughout the lifespan.

KEY QUESTIONS

› What characterizes the sexual behavior patterns of adulthood?

› What are some important aspects of sexual relationships in late adulthood?

Films, television shows, magazines and Internet sites tend to offer overheated images of sexual activity. If you believe the not-so-subtle media messages, everyone (except you) has such an active, steamy, and varied sex life that you can't help wondering how anyone (except you) ever finds the time to get their laundry done.

So, to prevent unnecessary despondency, let's deal with the "everybody's-sex-life-is-better-than-mine" issue at the beginning of this section. *Are* the media images accurate? Here's what sexual behavior expert Robert T. Michael and his colleagues (1994) had to say about the matter:

> The public image of sex in America bears virtually no relationship to the truth. The public image consists of myths, and they are not harmless, for they elicit unrealistic and at worst dangerous misconceptions about what people do sexually. These resulting false expectations can badly affect self-esteem, marriages, relationships, even physical health.

FOCUS ON NEUROSCIENCE

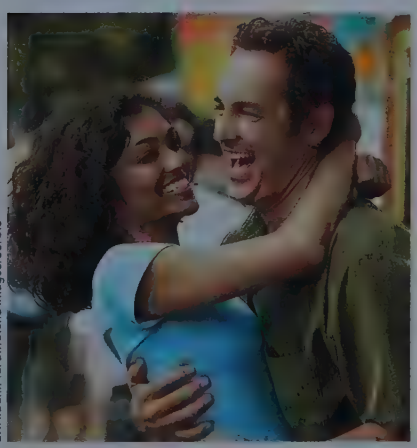
Romantic Love and the Brain

When it comes to love, it's been said that the brain is the most erotic organ in your body. Indeed, being head over heels in love is an emotionally intoxicating brain state. Do the overpowering feelings of romantic love involve a unique pattern of brain activity?

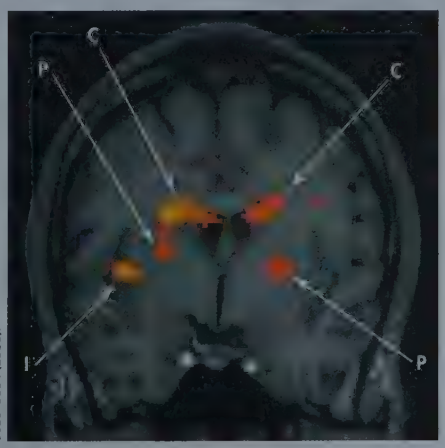
Using functional magnetic resonance imaging (fMRI) to detect brain activity, researchers have investigated love-struck young adults, all professing to be "truly, deeply, madly in love" with their romantic partner (Fisher & others, 2006; Stein & Vythilingum, 2009). In these studies, each participant is typically scanned several times while gazing at a photo of the romantic partner. Alternating with the "love" scans were "friendship" scans taken while the participant looked at a photo of a good friend who was of the same sex as the loved one.

In one study, researchers Andreas Bartels and Semir Zeki (2000) showed that romantic love activates brain areas that are involved in other positive emotions, such as happiness, but in a way that represents a unique pattern. Shown here is a side-to-side fMRI brain scan depicting some of the brain areas activated by romantic love. Compared to looking at a photo of a close friend, looking at a photo of one's romantic partner produced heightened activity in four brain areas associated with emotion, including the *anterior cingulate cortex* (not shown), *caudate nucleus* (C), *putamen* (P), and *insula* (I).

Given the complexity of the sentiment of romantic love, researchers have been surprised that the brain areas activated were so small and limited to so few regions (Stein & Vythilingum, 2009). (Perhaps this lack of extensive brain activation explains why love-struck individuals are sometimes oblivious to everything except the object of their infatuation.) Nonetheless, the four activated brain areas offer some insight into the intoxicating effects of romantic love. Why? Because these are the same brain areas that are activated in response to euphoria-producing drugs, such as opiates and cocaine. Clearly, there seem to be some close neural links between romantic love and euphoric states (Beauregard & others, 2009).



LWA/Dann Tardif/Blend Images/Corbis



A. Bartels and S. Zeki. University College London. Originally published in NeuroReport, "Neural Basis of Romantic Love," vol. 11, no. 17, pages 3829–3834 (2000).

Feelings of euphoria are just one of the many sensations, thoughts, and emotions that accompany moments of impassioned, romantic love. As is shown in the fMRI scan, romantic love also produces a unique pattern of activation in the brain.

IN FOCUS

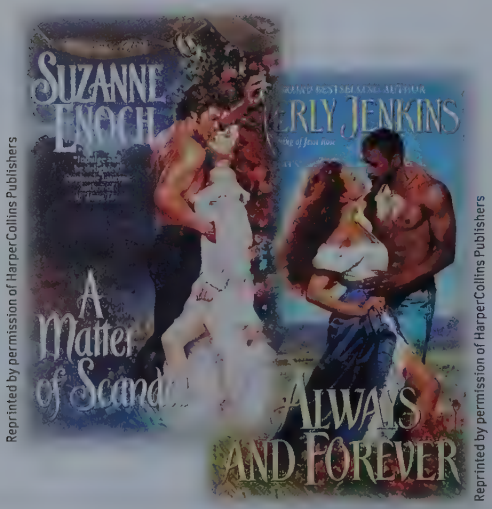
Everything You Wanted to Know About Sexual Fantasies

The brain is the most erotic organ in the human body. After all, the brain plays a pivotal role in the expression of human sexuality. What people think about and imagine influences how they behave sexually. And, in turn, people's sexual behavior can influence the content of their *sexual fantasies*—erotic or sexually arousing mental images. In the realm of human sexuality, the mind–body connection is definitely a two-way street.

We experience sexual fantasies in the private theater of our own minds, but psychologists have discovered that sexual fantasies are a nearly universal human phenomenon. Using checklists and questionnaires, researchers have been able to answer various questions about people's sexual fantasies. With the help of excellent research summaries by University of North Texas psychologists Joseph W. Critelli and Jenny M. Bivona (2008) and University of Vermont psychologists Harold Leitenberg and Kris Henning (1995), we'll answer some questions about this private human experience.

When and How Often Do People Have Sexual Fantasies?

Sexual fantasies tend to begin during the adolescent years, and almost all adult men and women (95 percent) report having had sexual daydreams. It is very common for both men and women occasionally to engage in sexual fantasies during intercourse. But compared to women, men report a higher incidence of sexual fantasies during masturbation and nonsexual activities. In short, men tend to think about sex more often than do women.



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What Do People Have Sexual Fantasies About?

If you accept the notion that any fantasy, sexual or not, is based to some degree on life experiences, the three most common types of sexual fantasies that men and women have won't surprise you. They are (1) reliving an exciting sexual experience, (2) imagining that they are having sex with their current partner, and (3) imagining that they are having sex with a different partner.

Do Male and Female Sexual Fantasies Differ?

There are some well-substantiated differences. First, men tend to fantasize themselves in active roles—that is, doing something sexual to their partner. In contrast, women tend to imagine themselves in sexually passive roles—that is, having something sexual done to them.

Second, men tend to have sexual fantasies with more explicit imagery, often involving specific sexual positions or anatomical details. Women are more likely to imagine romantic themes, including warm, loving feelings about their partner and details about the romantic ambiance of the scene.

Third, men are more likely to imagine having sex with multiple partners (King & others, 2009; Zurbriggen & Yost, 2004). As Leitenberg and Henning (1995) put it, "Fantasizing about having sex with multiple partners at the same time appears to be more consonant with the male stereotype of being a 'superstud' than with the female stereotype of wanting a close, loving, monogamous relationship."

Are Sexual Fantasies Psychologically Unhealthy?

Some people are troubled by their sexual fantasies. About 25 percent of people experience some degree of guilt over having sexual fantasies. This guilt is usually due to the belief that their sexual fantasies are immoral, are harmful to their relationships, or indicate that something is wrong with them.

However, the people who engage in sexual fantasies most often tend to exhibit the *least* number of sexual problems and the *lowest* level of sexual dissatisfaction. The bottom line: sexual fantasies seem to be a common, normal element of human sexuality.

In this section, we'll use descriptive research to explore the "Who's doing what, when, how often, and with whom" questions about human sexuality. To give you an accurate picture, we'll rely on data from three scientifically conducted national surveys. The *National Survey of Sexual Health and Behavior (NSSHB)* focused on the sexual practices of Americans between the ages of 14 and 94 (Reece & others, 2010a). The *National Survey of Family Growth (NSFG)* targeted a younger group, studying the sexual behavior of males and females between the ages of 15 and 44 (Mosher & others, 2005). And, the *National Social Life, Health, and Aging Project (NSHAP)* studied sexual practices and attitudes in older Americans ages 57–85 (Waite & others, 2009).

How Many Sexual Partners Do People Have?

Males tend to desire and have more sexual partners than females (King & others, 2009; Petersen & Hyde, 2010). More than half (53%) of men, but only about a third (31%) of women in the 25 to 44 age group reported having had seven or more sexual partners to date (Mosher & others, 2005). Now consider a shorter time frame and take your best guess. How many sexual partners did most adults in the same age group have in the past year? Over 70% of males and females had either *one* or *no* sexual partner in the previous year (Mosher & others, 2005).

Clearly, as Robert Michael noted above, such scientific findings contradict many of the steamy, hypersexualized media portrayals of adult sexuality. Fictional portrayals aside, the obvious question is why most people in this age group report having just one sexual partner in the past year. The short answer is commitment and marriage. The onset of adulthood marks a commitment to the task of establishing long-term, intimate relationships. During their twenties, most men and women develop an intimate relationship with another adult. By the age of 30, most Americans are part of a couple—either married or cohabiting with someone (Goodwin & others, 2009; Mosher & others, 2005).

Marriage continues to be a cornerstone of American society as well as a major developmental milestone for most people on the trek through adulthood. Even



Jeff Greenberg/PhotoEdit

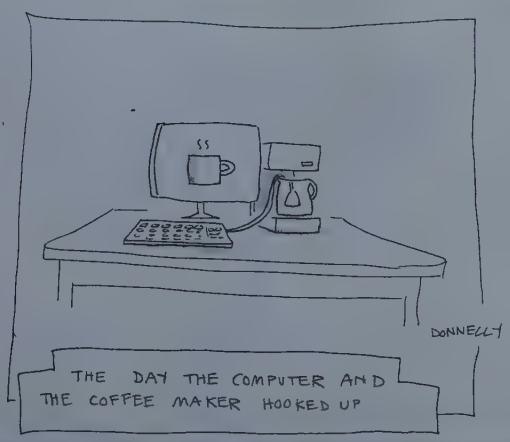
Looking for Mr. or Ms. Right Although people today are marrying at a later average age than they did in previous generations, most young adults are involved in an intimate, long-term relationship by the time they reach their mid-twenties. People are most likely to form an intimate relationship with someone who is similar to them and who is part of their existing social network.

IN FOCUS

Hooking Up on Campus

"Hooking up" is a relatively new trend on college campuses. And while there's nothing new about casual sex among young adults, hooking up does differ in some key ways from casual sex. Casual sex refers, by definition, to sexual intercourse, with or without an emotional or friendly relationship. In a "friends with benefits" relationship, the sexual relationship is presumed to be secondary to the friendship.

In contrast, "hooking up" refers to a no-strings-attached, sexual encounter that can range from kissing and cuddling to sexual intercourse. The actual sexual behaviors may vary, but the common thread is that the sexual intimacy is not accompanied by the expectation of a committed relationship or even future interactions (Owen & others, 2010; Reiber & Garcia, 2010).



Liza Donnelly

On many college campuses, hooking up is very common. Studies have shown that about 80% of students reported hooking up at least once while they were in college, and more than half had hooked up during the previous year (Owen & others, 2010; Reiber & Garcia, 2010). College men generally hold more permissive attitudes toward casual sex than women, and hooking up is no exception (Petersen & Hyde, 2010). Perhaps not surprisingly, alcohol use is strongly implicated in hooking up behavior. Alcohol precedes almost two-thirds of hook ups (Fielder & Carey, 2010; Vander Ven & Beck, 2009).

Male college students have more favorable attitudes toward hooking up than female college students, but the sexes may not be as far apart as some people think (Bradshaw & others, 2010). As compared to men, women tend to report more negative emotional reactions after hooking up than men. However, *both* men and women reported that hooking up had overall been a more positive than negative experience (Owen & Fincham, 2010).

Although hooking up is widely accepted on college campuses, both sexes overestimate the degree to which the opposite sex is comfortable with hooking up (Reiber & Garcia, 2010). Today's young adults haven't given up on the hope of creating a long-term committed relationship. However, college students appear to have embraced what appears to be a larger cultural shift toward more flexible, less clearly defined relationships (Bisson & Levine, 2009).

so, the timing of marriage has changed over the past couple of generations. In 1960, the average age of first marriage for males was 23 versus 20 for females. Today, the average age of first marriage is about 28 for males and 26 for females (Goodwin & others, 2009). Most young adults experience considerable social pressure to "settle down," find a partner, and marry. Doing so confers numerous benefits, not the least of which is the social, legal, and moral acceptance of the sexual partnership.

How Often Do People Engage in Sexual Activity?

Perhaps the widest disparity between the media images and scientific results involves the issue of how often people have sex. Here's what the NSSHB found: About 35% of men and 40% of women ages 18–94 had not had sexual intercourse at all in the past year. About 15% of men and women had sex a few times per year to monthly. Approximately 30% of men and women have sex a few times per month to weekly. About 15% of men and women have sex 2–3 times per week, and only 4% of men and women have sex 4 or more times per week (Herbenick & others, 2010a; Reece & others, 2010b). So, any way you look at it, the most frequent activity in America's bedrooms is sleep, not sex.

In general, most people between the ages of 18 and 59 have engaged in traditional sexual behaviors in the past year. Vaginal intercourse is quite common for both men (80%) and women (86%). About 37% of both men and women give oral sex to their partner and about 44% of men and 31% of women have received it. A very small minority of men and women (about 3–6%) have engaged in anal sex in the past year (Herbenick & others, 2010a). However, the popularity of anal sex is higher among younger adults than older adults (Mosher & others, 2005).

Which Americans have the most active sex lives? Although you might guess young, single adults, the fact is that married or cohabiting couples have the most active sex lives (Herbenick & others, 2010b; Reece & others, 2010). If you think about it, this finding makes sense. Sexual activity is strongly regulated by the availability of a sex partner. Being a member of a stable couple is the social arrangement most likely to produce a readily accessible sexual partner.

Do people enjoy their sex lives? According to the NSSHB, about 85% of men, as compared to two-thirds of women, reported that their most recent sexual experience was pleasurable. Interestingly, men tended to overestimate their partner's enjoyment. About 85% of men thought that their partner had experienced an orgasm in their last sexual encounter, but only about 64% of women agreed (Herbenick & others, 2010a, 2010b). For both women and men, diversity of sexual repertoires was associated with a greater likelihood of achieving orgasm (Herbenick & others, 2010a, 2010b).



John Lund/Marc Romanelli/Jupiterimages

Intimacy in Middle Adulthood Marriage is the mainstay of middle adulthood. Among those in the 45 to 54 age group, more than two-thirds are married (U.S. Census Bureau, 2008a). Although middle-aged marriage is often depicted as boring in the media, studies consistently show that marital quality improves from young adulthood to middle adulthood. As children are successfully launched into the world, couples have more time for each other and the activities that interest them. It is in this context—the marital relationship—that middle-aged adults realize the most satisfying affectionate, sexual, and emotional experiences (Gorchoff & others, 2008; Henry & others, 2007; Rosen & Bachmann, 2008).

Sex After Sixty? Seventy?! Eighty?!!

The myth? Sexual interest and potency evaporate on the day you become eligible for Medicare. The reality? More than half of people aged 60 to 85 years old are sexually active. In fact, about one-third of 75- to 85-year-olds remain sexually active (Lindau & Gavrilova, 2010).

Age, by itself, is not the most critical factor influencing senior sexuality. Physical health and having an intimate partner exert a stronger influence on the likelihood and frequency of sexual activity among senior adults (Lindau & Gavrilova, 2010). But when serious physical health issues are not an issue, two-thirds (65%) of those in the 65-to-74 age range who had an intimate partner had sex more than 2 or 3 times per month. Among the 75-to-85 crowd with an intimate companion, more than half (54%) had sex more than 2 or 3 times per month (Lindau & others, 2007; Waite & others, 2009).

Aging can have some effects on the friskiness of seniors. About half of all sexually active senior adults report at least one bothersome sexual problem (Lindau & Gavrilova, 2010). As men and women age, it takes longer to become sexually aroused and achieve orgasm (Waite & others, 2009). For women, vaginal lubrication typically occurs more slowly, sometimes necessitating the use of lubricants during intercourse. With increasing age, men are more likely to experience difficulties achieving or maintaining erection (Gades & others, 2009). But despite the inevitable physical changes that accompany aging, it is clear that love and affection can continue to thrive—and grow—in the twilight years of life.

Many people who have lost their spouse through death or divorce continue to date as they grow older. Older men date more often than older women, mostly because they have a larger pool of potential dating partners. Dating serves a different function in late adulthood than in early adulthood. For young adults, dating is part of the process of selecting a mate. For older adults, dating fills the need for companionship and sexual intimacy. Many older adults have a serious relationship with a single, special dating partner, or may even live with their partner, but have no intention of remarrying (King & Scott, 2005; Waite & others, 2009). In late adulthood, dating helps prevent loneliness and can meet the need for physical and emotional intimacy that continues throughout the lifespan.



Pam Francis/The Gamma-Liaison Network

Sexuality in Late Adulthood Sexual interest and activity are important dimensions of the lives of many senior adults. In recent surveys of older Americans, nearly half reported that they engage in sexual activity at least once a month (Lindau & others, 2007; Waite & others, 2009). Another survey found that more than 70 percent of sexually active seniors said they were as satisfied or more satisfied with their sex lives compared to when they were in their forties (National Council on Aging, 1998).

Sexual Disorders and Problems

KEY THEME

› Sexual dysfunctions are consistent disturbances in desire, arousal, or orgasm that cause psychological distress.

KEY QUESTIONS

› How prevalent are sexual problems, and who is most likely to experience them?

› What are the paraphilias?

› What are sexually transmitted diseases, and what characterizes the AIDS epidemic today?

Almost everyone experiences an occasional glitch in responding sexually, such as failing to feel sexually aroused on a particular occasion. What can cause this to happen? There are a number of rather ordinary reasons. You might be feeling tired or grumpy with your sexual partner. Anxiety, including anxiety over your sexual performance, can also interfere with sexual functioning. Drinking too much alcohol can disrupt the ability to achieve sexual arousal or orgasm. And, of course, it's possible that your well-intentioned partner is doing something that you don't find sexually stimulating, as in "Let's just skip the whipped cream next time, okay?"

For most people, such disruptions in sexual response are temporary. In contrast, some people experience persistent sexual problems, or sexual dysfunctions. **Sexual dysfunctions** are consistent disturbances in sexual desire, arousal, or orgasm that cause psychological distress and interpersonal difficulties (American Psychiatric Association, 2000a).

sexual dysfunction A consistent disturbance in sexual desire, arousal, or orgasm that causes psychological distress and interpersonal difficulties.



Not Rising to the Occasion: 1 in 5 Males From NASCAR to the NFL, it's hard to escape the advertising pitches for Viagra and its pharmaceutical rivals, Levitra and Cialis. In one year alone, direct to consumer advertising for the three *erectile dysfunction* (ED) drugs topped $300 million in the U.S. (Consumer Reports AdWatch, 2008). Of the three medications, Viagra is most commonly prescribed. In the first decade since its introduction, over 1 *billion* little blue Viagra pills have been dispensed (Lyons, 2008).

Viagra, Cialis, and Levitra temporarily alleviate erectile dysfunction by increasing blood flow to the penis. ED is often a symptom of some other serious condition impairing or restricting the body's blood flow, such as diabetes, cardiovascular disease, high blood pressure, obesity, or smoking (Tostes & others, 2008; J. C. Lee & others, 2010).

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How Common Are Sexual Problems?

Sexual dysfunction among adult Americans is much higher than you might think: according to one comprehensive survey, nearly half of women and almost a third of men suffered from at least one sexual problem (Lewis & others, 2004). Data from the NSSHB suggest that in their most recent sexual experience, 17% of men and 35% of women reported some degree of difficulty with either erection or vaginal lubrication (Herbenick & others, 2010a, 2010b).

For about 20% of women, low sexual desire was a common sexual problem. And, about 20% of men report difficulty achieving or maintaining an erection (Derogatis & Burnett, 2008). Generally speaking, health problems and aging are associated with a greater likelihood of sexual problems, especially among men.

Nevertheless, one large study found that sexual problems were most common among young women and men older than age 50 (Laumann & others, 1999, 2000). Older men tended to report sexual problems related to the aging process: erection difficulties and lack of interest in sex. In contrast, sexual problems tended to *decline* with age in women. According to Laumann and his colleagues (1999), "Since young women are more likely to be single, their sexual activities involve higher rates of partner turnover as well as periodic spells of sexual inactivity. This instability, coupled with inexperience, generates stressful sexual encounters, providing the basis for sexual pain and anxiety."

Categories of Sexual Dysfunctions

Both sexes can experience psychological distress or interpersonal difficulties caused by having little or no sexual desire, a condition called **hypoactive sexual desire disorder** (Hackett, 2008; West & others, 2008). Of course, the frequency with which people want to have sex varies over the lifespan and according to personal preference. Sometimes what seems like "low desire" in one partner may actually reflect "high desire" in the other partner.

More extreme is **sexual aversion disorder,** in which a person actively avoids genital contact with a sexual partner because of extreme anxiety, fear, or disgust over sexual contact. Both men and women can experience chronic genital pain before, during, or after intercourse, a condition called **dyspareunia.**

Some sexual dysfunctions can be experienced by men only or women only. When a man experiences a recurrent inability to achieve or maintain an erection, it's called **erectile dysfunction,** or **ED** (Lewis & others, 2008). At the opposite extreme, an erect male may experience recurring delays or a complete absence of the ability to achieve orgasm through intercourse, a condition called **male orgasmic disorder.** Although the man may not be able to achieve orgasm during intercourse, he may be able to do so through other means, such as by being manually or orally stimulated by his partner. A man may experience considerable stress over recurrent episodes of **premature ejaculation,** in which he reaches sexual climax too soon, often immediately before or shortly after penetration.

When a female experiences distress over consistent delays in achieving orgasm or the complete inability to achieve orgasm, it's called **female orgasmic disorder.** Women can also experience a condition called **vaginismus**—the persistent, involuntary contraction of the vaginal muscles, resulting in uncomfortable or painful intercourse. In severe cases, the vaginal muscle spasms may be so severe as to prevent penetration (Farmer & others, 2008).

What causes sexual dysfunctions? Physical or medical conditions are involved in some disorders, such as erectile dysfunction. ED is often a symptom of an underlying medical condition that impairs the body's blood flow, such as diabetes, cardiovascular disease, high blood pressure, or obesity. Smoking can also cause ED by constricting blood vesicles (Tostes & others, 2008). Other problems, such as premature ejaculation and vaginismus, often involve psychological factors, such as anxiety about sex, sexual performance, or unpleasant past sexual experiences. Fortunately, many sexual dysfunctions can be treated by psychologists and physicians who are specially trained in sex therapy (Meston & others, 2008; Rowland & McMahon, 2008).

hypoactive sexual desire disorder A sexual dysfunction characterized by little or no sexual desire.

sexual aversion disorder A sexual dysfunction characterized by active avoidance of genital sexual contact because of extreme anxiety, fear, or disgust.

dyspareunia A sexual dysfunction characterized by genital pain before, during, or after intercourse.

erectile dysfunction (ED) In males, sexual dysfunction characterized by a recurring inability to achieve or maintain an erect penis.

male orgasmic disorder In males, sexual dysfunction characterized by delayed orgasm during intercourse or the inability to achieve orgasm during intercourse.

The Paraphilias

Unusual Sexual Fantasies, Urges, or Behaviors

When a person's sexual gratification is highly or completely dependent on fantasies, urges, or behaviors that fall outside the socially accepted range of sexual behavior, the person is said to have a **paraphilia.** As the description implies, what gets defined as a paraphilia is strongly influenced by social mores and cultural traditions (Bhugra & others, 2010). For example, most western cultures no longer define homosexuality as a disorder, but not all cultures share that view. Fetishes, transvestism, and masturbation are other sexual behaviors that may or may not be considered a paraphilia depending on the culture.

Are the paraphilias merely unusual behaviors or preferences? No. To be defined as a true disorder, the behavior must cause distress to the person or to their nonconsenting partners or targets. Thus, paraphilias are fantasies, urges, and behaviors that may involve suffering or humiliation, children, another nonconsenting adult, or nonhuman objects. As a rule, men are more likely than women to exhibit a paraphilia (Gijs, 2008; Bhugra & others, 2010).

Exactly what kinds of fantasies, urges, or behaviors are we talking about? Here are brief descriptions of the most common paraphilias:

- *Exhibitionism*—sexual arousal achieved by publicly exposing one's genitals to shocked strangers
- *Frotteurism*—sexual arousal from touching and rubbing against a nonconsenting person, usually in a crowded public situation, such as a crowded bus or subway car
- *Fetishism*—sexual arousal in response to inanimate objects (e.g., female undergarments, shoes, leather, fur, body piercings, uniforms) or body parts not typically associated with sexual arousal (e.g., feet, hair, legs)
- *Transvestic fetishism*—in heterosexual males, sexual arousal from cross-dressing in women's clothes
- *Pedophilia*—sexual fantasies, urges, or behaviors involving sexual activity with a prepubescent child (generally age 13 or younger)
- *Voyeurism*—sexual arousal from observing an unsuspecting person who is disrobing, naked, or engaged in sexual activity
- *Sexual sadism*—sexual arousal achieved through intentionally inflicting psychological or physical suffering on another person
- *Sexual masochism*—sexual arousal in response to actually being humiliated, beaten, bound, or otherwise made to suffer

Unlike the person with a sexual dysfunction, the person who has a paraphilia is often not psychologically distressed by it. Rather, these individuals typically come to the attention of mental health professionals only when their behavior has created a conflict with their sexual partner, has been discovered by a family member or coworker, or has resulted in arrest (Gijs, 2008). Some paraphilias, such as pedophilia and voyeurism, are illegal.

What causes a particular paraphilia to develop? Theories involving biological and psychological causes exist, but there are no solid answers. The exact causes of paraphilias remain obscure (Lussier & others, 2008).

Sexually Transmitted Diseases

No discussion of human sexuality would be complete without discussing the dangers of **sexually transmitted diseases,** abbreviated **STDs.** An estimated 19 million cases of STDs are diagnosed annually in the United States. Given that statistic, consider this additional fact: Young people aged 15 to 24 account for almost *half*—48 percent—of those cases (Centers for Disease Control and Prevention, 2008).

Transmitted primarily through sexual contact, STDs include bacterial, viral, and parasitic infections (see Table 10.2 on the next page). Bacterial STDs include

- **premature ejaculation** In males, sexual dysfunction characterized by orgasm occurring before it is desired, often immediately or shortly after sexual stimulation or penetration.
- **female orgasmic disorder** In females, sexual dysfunction characterized by consistent delays in achieving orgasm or the inability to achieve orgasm.
- **vaginismus** Sexual dysfunction characterized by persistent, involuntary contractions or spasms of the vaginal muscles, which result in uncomfortable or painful intercourse.
- **paraphilia** (pair-uh-FILL-ee-uh) Any of several forms of nontraditional sexual behavior in which a person's sexual gratification depends on an unusual sexual experience, object, or fantasy.
- **sexually transmitted diseases (STDs)** Any of several infectious diseases that are transmitted primarily through sexual intercourse or other intimate sexual contact.



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"The security screener said I have exquisite feet."

TABLE 10.2

Major Sexually Transmitted Diseases

	Symptoms
Bacterial	
Gonorrhea	*Men:* yellowish penile discharge; burning or painful urination
	Women: often no early symptoms; vaginal discharge; burning or painful urination
Syphilis	Painless chancre, or sore; swollen lymph nodes
Chlamydia	*Men:* many are symptom-free; burning or painful urination
	Women: most are symptom-free; painful urination and vaginal discharge
Parasitic	
Pubic lice	Intense itching in the pubic area
Viral	
Genital herpes	Painful blisters on or inside the genitals; sometimes accompanied by fever, swollen lymph nodes, bodily aches and pains
AIDS (acquired immune deficiency syndrome)	Initial HIV infection may be accompanied by mild flulike symptoms; HIV virus can be dormant for years; AIDS is characterized by severe weight loss and increased susceptibility to other diseases and infections

gonorrhea, syphilis, and *chlamydia. Pubic lice* is an example of a parasitic STD. Both bacterial and parasitic STDs can be cured with appropriate treatments, such as antibiotic medications or antiparasitic shampoos. In contrast, viral sexually transmitted diseases, such as *genital herpes* and *AIDS,* cannot be cured. However, their symptoms can often be reduced with treatment. Both genital herpes and AIDS are discussed in more detail below and on the next page.

Left untreated, many STDs can eventually create significant health problems. This is especially troubling because it is completely possible for a person to be unaware that he or she is infected with an STD. For example, *chlamydia* is a bacterial infection that occurs most commonly among young women and often does not produce symptoms (Centers for Disease Control and Prevention, 2008). Although it can easily be cured with antibiotics, chlamydia can cause severe health consequences for women if left untreated, including pelvic inflammatory disease and infertility. Equally troubling, an infected person can unknowingly pass on an STD to sexual partners.

Genital Herpes

genital herpes A sexually transmitted disease caused by the herpes simplex virus that can produce outbreaks of painful blisters in the genital and anal regions.

AIDS (acquired immune deficiency syndrome) Disease caused by the *human immunodeficiency virus* (HIV), which selectively attacks helper T cells in the immune system, progressively weakening the body's ability to fight infections and diseases.

human immunodeficiency virus (HIV) A retrovirus that infects, destroys, and reduces the number of helper T cells in the immune system, producing AIDS.

With approximately 1.5 million new infections occurring per year, **genital herpes** is one of the most common sexually transmitted diseases in the United States. Altogether, more than 45 million people aged 12 and older have had a genital herpes infection. It is more common in women than men. Approximately one out of four women in the United States has had a genital herpes infection versus one out of eight men (Centers for Disease Control and Prevention, 2008).

Although it can be caused by *herpes simplex virus type 1* (HSV-1) or *herpes simplex virus type 2* (HSV-2), most cases of genital herpes are caused by HSV-2. Many people with herpes have no symptoms and are unaware that they are infected. In one national survey, less than 10 percent of the people who tested positive for herpes knew they were infected (Fleming & others, 1997).

However, if an initial herpes infection triggers an outbreak, the accompanying symptoms can be pronounced and distressing. Noticeable signs can include flulike symptoms, low-grade fever, and swollen glands. Blisters may appear on or around the genitals or rectum. Eventually the blisters break, leaving tender sores (ulcers) that may take several weeks to heal, especially the first time they appear. It's not unusual for another outbreak to occur after the first one, usually within a few weeks or months.

However, the second and any subsequent outbreaks are almost always less severe—and briefer—than the first outbreak. Having three to five brief outbreaks a year is typical. Several psychological factors, including stress, depression, and poor coping strategies are associated with recurring outbreaks (Goldmeier & others, 2008). As a general rule, the number of annual outbreaks tends to decrease as the person gets older.

Although HSV-1 and HSV-2 can be transmitted by contact with the sores that occur during an outbreak, the viruses can also be transmitted between outbreaks from skin that does *not* appear to be broken or to have a sore. In other words, transmission can occur from an infected partner who does not have visible sores and may not even know that he or she is infected.

Generally, a person can get an HSV-2 infection only during sexual contact with someone who already has a genital HSV-2 infection. HSV-1 is more commonly associated with infections of the mouth and lips, so-called fever blisters. However, HSV-1 infection of the genitals can also occur when there is oral–genital or genital–genital contact with a person who has an HSV-1 infection. Genital HSV-1 outbreaks tend to recur less regularly than genital HSV-2 outbreaks.

People often experience a great deal of psychological distress when they first learn that they are infected with genital herpes. Feelings of anger and depression are common, especially among women. Supportive counseling can be helpful in working through various psychological issues and developing psychologically healthy coping strategies (Barnack-Tavlaris & others, 2011).

To date, there is no cure for genital herpes. However, antiviral medications can shorten and prevent outbreaks during the period of time the person takes the medication.

HIV and the AIDS Epidemic

AIDS, or **acquired immune deficiency syndrome,** is a disease that gradually depletes and weakens the human immune system. It is caused by the **human immunodeficiency virus (HIV),** which enters the bloodstream through the exchange of infected bodily fluids, primarily semen, vaginal fluids, and blood. HIV is typically transmitted by having unprotected sexual intercourse or by sharing needles or syringes with an infected person. HIV can also be transmitted by an infected mother to her infant during pregnancy, birth, or breast-feeding. Less commonly, it can be transmitted by receiving a transfusion of infected blood.

After infecting human cells, HIV uses the energy and nutrients provided by those cells to reproduce. If a person is otherwise healthy, the virus can exist in that person's body for 10 to 15 years without causing any apparent symptoms. In other words, the infected person can look and feel perfectly healthy for years. Nevertheless, the HIV-infected person is highly infectious and can transmit the virus to other people. The only way to determine whether HIV is present in a person's body is through a blood test. Commonly used HIV tests detect antibodies produced by the immune system in response to the virus. It can take up to three months for the antibodies to appear in a person's blood after he or she is infected.

As you can see in Table 10.3 on the next page, an estimated 1.2 million people in the United States are infected with HIV, including some 200,000 people who do not know they are infected (Centers for Disease Control and Prevention). Even though HIV-infected, a person may not show signs of AIDS. Hence, the term *AIDS* refers to the most advanced stages of HIV infection. When the virus becomes active, it selectively attacks a key component of the body's immune system: *CD4 positive helper T cells.* As you'll see in Chapter 13, on stress and health, helper T cells normally mobilize other immune system cells to fight off diseases and infections.

Nelson Mandela: "A Tragedy of Unprecedented Proportions"
Mandela is shown here with actor Will Smith at the June, 2008 "46664" concert in honor of Mandela's 90th birthday. 46664 was Mandela's prisoner identification number during his 27-year imprisonment for anti-apartheid activity in South Africa. Today, 46664 is a global campaign that focuses on HIV prevention. The number symbolizes Mandela's insistence that no human being should ever be reduced to a simple number—including the millions of people living with HIV. In Mandela's words, "A tragedy of unprecedented proportions is unfolding in Africa. Today in Africa, AIDS is claiming more lives than the sum total of all wars, famines, and floods, and the ravages of such deadly diseases as malaria. We must act now for the sake of the world."



REUTERS/Andrew Winning/Newscom

TABLE 10.3

The AIDS Epidemic

	United States	Globally
People living with HIV	1.2 million	33.0 million
Women living with HIV	276,000	15.5 million
Children living with HIV	3,775	2.0 million
People newly infected in the past year	56,300	2.7 million
Children newly infected in the past year	111	370,000
AIDS-related deaths	14,627	2.1 million
Deaths since 1981	596,000	25+ million

Sources: UNAIDS/WHO, 2008a, 2008c; Centers for Disease Control and Prevention, 2008a, 2008c; H. Hill & others, 2008.

Note: Children defined as ages 0–14 years for global figures; 0–12 years for U.S. figures.

As the HIV virus progressively weakens the immune system, the person becomes highly susceptible to other diseases, including different forms of pneumonia, tuberculosis, cancer, cardiovascular disease, and encephalitis (inflammation of the brain and spinal cord). Eventually, the immune system becomes so deficient that the person succumbs to some opportunistic infection that overwhelms the weakened body.

In the United States, the three groups at greatest risk of becoming infected by HIV are: a) men who have sex with men, b) intravenous drug users, and c) heterosexuals who have sex with people who are already at high risk for HIV infection. However, no one is immune to HIV. Heterosexual transmission accounts for about one-third of the new HIV infections each year in the United States (H. Hall & others, 2008). Although some women become infected with HIV through injection drug use, most women are infected through sexual contact with HIV-infected men. And as you can see in Figure 10.4, HIV is an epidemic primarily of young people.

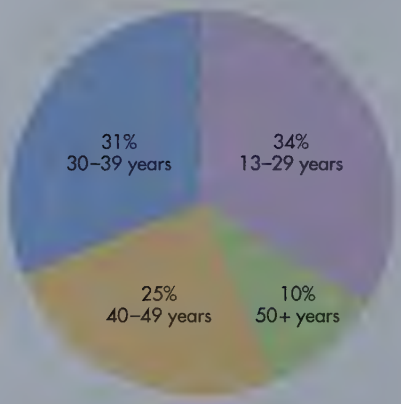


FIGURE 10.4 Estimated New HIV Infections, by Age, 2006

Sources: Centers for Disease Control and Prevention, 2008c; H. Hall & others, 2008.

The annual rate of new HIV infections has been stable in the United States for over a decade. Approximately 55,000 Americans are newly infected with HIV each year (Hall & others, 2008). Of those newly infected people, approximately one-quarter are unaware of their HIV infection. Unknowingly, these people account for more than half of the new HIV infections each year.

By itself, race is not a risk factor for HIV infection. However, African Americans are more severely affected by HIV than any other racial or ethnic group in the United States (see Figure 10.5). Black Americans account for approximately 45% of the new HIV infections each year, whites for 35%, and Hispanics for 17% (Hall & others, 2008). The HIV incidence among African Americans has been stable at an unacceptably high level since the early 1990s. One contributing factor to the higher rate of infection is the lack of access to health care and the stigma associated with being HIV-infected (Centers for Disease Control and Prevention, 2008a, 2008c).

Technically, HIV is classified as a *retrovirus*. Although researchers have yet to discover a cure for HIV/AIDS, the progression of the disease can be slowed by using a combination of antiretroviral drugs. Currently, there are 30 antiretroviral drugs approved by the FDA to treat people infected with HIV. In one way or another, the different antiretroviral drugs work by slowing the virus's rate of reproduction. Although they can suppress the virus, the antiretroviral drugs do not actually *kill* the virus. Because the drugs do not completely eliminate HIV from the body, they need to be taken continuously.

Adding to the treatment challenge is that as HIV reproduces itself, variants of the HIV virus emerge in the person's body. Some of these variations can display resistance to a particular antiretroviral drug. To counteract this, people infected with HIV

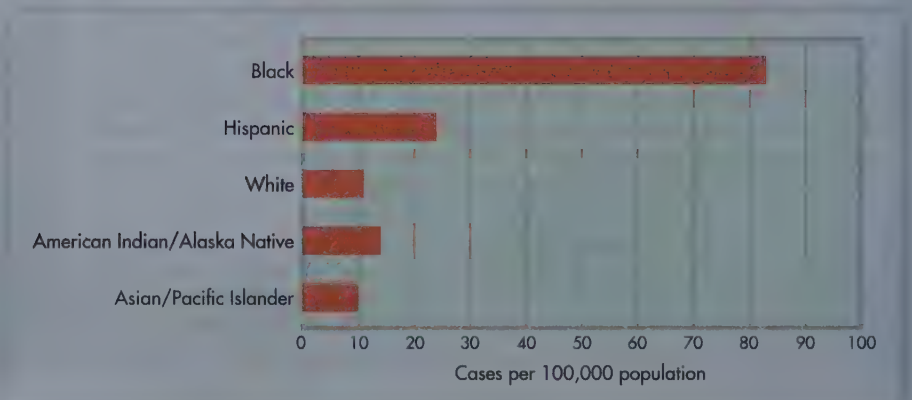


FIGURE 10.5 Estimated Rates of New HIV Infections, by Race/Ethnicity, 2006

Sources: Centers for Disease Control and Prevention, 2008c; H. Hall & others, 2008.

take a combination of different kinds of antiretroviral drugs to suppress the virus. These antiretroviral "cocktails" have improved both the quality and duration of life for those who are HIV infected. On the other hand, the combination drug treatments often have many side effects, are complicated to administer, and are expensive. HIV patients may take up to 20 pills a day, and must follow a complicated dosing schedule.

Because of antiretroviral drug treatments, the death rate from AIDS has sharply decreased and stabilized in the United States and other industrialized countries. At present in the United States, about 15,000 people a year die from AIDS (Centers for Disease Control and Prevention, 2008a).

However, the story is very different in developing nations, where drug-treatment programs are only now becoming available on a large scale. In some areas of Africa, infection rates are extremely high. In Botswana and Swaziland, for example, approximately 35 percent of the adults are infected with HIV. HIV infection rates are also increasing in Asia and eastern Europe. As you can see in Table 10.3, worldwide, more than 33 million people are currently living with HIV and AIDS (Kilmarx, 2009). Most are in Africa, but infection rates are increasing in eastern Europe and central Asia. Worldwide, more than 25 million people have died because of AIDS (UNAIDS/WHO, 2008a).



Daniel Rosenthal/Laif/Redux

The AIDS Epidemic: Looking at the One "If I look at the mass, I will never act. If I look at the one, I will." Mother Teresa's famous quote is reflected in the actions of many people who are responding to Africa's AIDS epidemic, one person at a time. One of those who acted was 33-year-old internist Dr. Patrick Ingiliz, who spent a year in the African nation of Malawi as part of a doctor exchange program. As a relative holds the young mother's baby, Dr. Ingiliz checks the woman's AIDS-related symptoms. One of the poorest economies in the world, Malawi has been hard hit by AIDS. Of its 13 million citizens, close to 1 million are positive for HIV. Some 70,000 people in Malawi die each year because of AIDS. One urgent priority for Malawi's government is caring for the more than 600,000 orphans whose parents have died of AIDS (UNAIDS/WHO, 2008c).

The ABCs of Preventing STDs

Despite widespread public awareness of the dangers of STDs, engaging in risky, unprotected sexual behavior remains common (J. Brown & Vanable, 2007; Kashubeck-West & Szymanski, 2008). For instance, one study found that 38% of sexually active students in grades 9–12 did *not* use a condom during their last experience of sexual intercourse (Eaton & others, 2010).

There are steps that any person can—and should—take to reduce the likelihood of getting a sexually transmitted disease. The ABC model summarizes three strategies as follows:

A = Abstinence

B = Be faithful

C = Condoms

Abstaining from sex is the one obvious way to avoid becoming infected with an STD. That said, if you choose to have sex, do so responsibly. If neither you nor your sexual partner is infected with any kind of STD, you can greatly limit your potential exposure to STDs by maintaining a monogamous sexual relationship. In other words, no cheating or casual hook-ups. Correctly and consistently using condoms and spermicides during sex is another precaution you can take to promote "safer" sex.

CONCEPT REVIEW 10.3

Sexual Behavior, Disorders, and Problems

Indicate whether each of the following statements is true or false. If a statement is false, correct it.

_____ 1. According to NSSHB data, young, single adults have the most active sex lives.

_____ 2. The most common sexual behavior for both men and women aged 18 to 59 is oral sex.

_____ 3. Almost 90 percent of people who test positive for the presence of a genital herpes infection were already aware that they were infected.

_____ 4. Sexual problems are most common among young adult women and men over the age of 50.

_____ 5. Paraphilias are more common among women than among men.

_____ 6. According to NSSHB data, over 70% of U.S. adults had one or no sexual partner in the past year.

_____ 7. ABC is an acronym used to promote safer sex practices. The letters stand for: attitude, behavior, communication.

_____ 8. Younger women are at greater risk than older women for HIV infection.



CLOSING THOUGHTS

From birth, each of us is profoundly influenced by the biological, social, cultural, and psychological forces that shape our gender identity and expression of sexuality. As you've seen in this chapter, a person's gender identity is firmly entrenched by late childhood and adolescence.

Throughout adulthood, the expression of sexuality centers on stable interpersonal relationships that are based not only on physical intimacy but also on emotional and psychological intimacy. Even in old age, the need for physical, emotional, and psychological intimacy remains strong.

Over the course of life, much of who we are is defined by our gender and sexual identity. Often without our awareness, that identity shapes the activities we are drawn to, the relationships we form, and how we react in many situations. Most people develop a conventional sense of gender identity and sexual orientation and form sexual relationships that follow the predominant patterns endorsed by society. But other people, like our friend Richard, are faced with the challenge of accepting themselves in a society that is often not very tolerant of sexual difference.

We hope that in reading this chapter, you've developed not only a greater appreciation of your own gender and sexual identity but also a better understanding of people whose gender identity or sexual orientation is different from your own. In Enhancing Well-Being with Psychology, we'll provide suggestions for overcoming gender differences that can interfere with the resolution of conflicts in intimate relationships.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Men, Women, and Conflict: Bridging the Gender Gap

"What's bothering you?"

"Me? Nothing. Why do you ask?"

"You've got that look on your face."

"What look?!"

"You know—that I'm mad-as-hell-and-don't-talk-to-me look."

"Just leave me alone, okay? What do you want to start a fight for?"

"Who's starting a fight? I'm *not* trying to start a fight. I just want to know what's wrong."

"Did I say there was anything wrong? There's nothing wrong. Can't I just sit here and read the paper without being hassled to death?"

"I'm not trying to hassle you! I'm just trying to figure out what you're ..."

"Did you hear what I said? Just leave me alone!"

"Yeah, but if you're mad about something, then maybe we should ..."

"Damn it! You just keep badgering me! *Just leave me alone!*" (Throws paper aside, gets up, and storms out, slamming door.)

Can you identify which is the male and which is the female speaker in this exchange? That's probably not a tough question. As we noted earlier in the chapter, women tend to be more comfortable than men about expressing their emotions. Beyond this basic difference, researchers have found that men and women communicate very differently, especially when they are trying to deal with problems, emotional issues, and interpersonal conflicts (Brizendine & others, 2010; Heene & others, 2007). In this section, we will look at some of those communication differences and consider how couples can learn to overcome them.

Conflict in Intimate Relationships

Being able to handle interpersonal conflict is important in any relationship, but especially in marriage. The demands and hassles of sharing and maintaining a household make occasional conflict in marriage virtually inevitable. Despite what many people think, the happiest marriages are not conflict-free. Instead, as psychologist John Gottman has discovered, conflict plays a key role in marital happiness and stability.

Gottman (2002, 2011) has intensively studied hundreds of married couples over the years (see Gottman & others, 2006). He's found that a couple's relationship grows only if the couple successfully reconciles the inevitable differences that occur. As Gottman (1994) explains, "A certain amount of conflict is needed to help couples weed out actions and ways of dealing with each other that can harm the marriage in the long run."

Gottman and his colleagues (2001, 2006) have also found that men and women react differently to conflict, particularly to conflicts that involve strong emotions. Men have typically learned to suppress and contain their emotions. In contrast, women tend to be more comfortable expressing their emotions. In general, women are more comfortable than men when it comes to dealing with emotional issues in intimate relationships.

According to Gottman (1994, 2002), women often become the "emotion managers" and "caretakers of intimacy" in close relationships. They tend to be more sensitive to problems that are developing in the relationship and more willing to talk about them. But when problems need to be resolved, Gottman has found, male and female patterns of reacting to and handling conflict often sabotage a couple's best efforts to resolve their differences.

BLONDIE



What goes wrong when a couple tries to resolve their differences? First, consider the two types of responses that Gottman (2011) has found to occur during emotional conflicts: flooding and stonewalling. *Flooding* means feeling overwhelmed (or "flooded") by your own emotions—feeling upset and out of control. When flooded, people experience high levels of physiological arousal. Heart rate and blood pressure skyrocket.

As an argument or conflict heats up, both men and women can become flooded by their emotions. That said, which sex do you think is *more* likely to become flooded? Men are. In his lab, Gottman (2002) has found that during marital conflict a husband's heart rate and blood pressure increase faster, elevate higher, and stay elevated longer than his wife's. Not only is this high level of physiological arousal extremely unpleasant, it also makes it very difficult for a man to listen to his partner's words. Hence, because men physiologically react so strongly to conflict, they tend to be less willing to engage in it.

When flooded, what do men typically do? They go into the *stonewalling* mode—they withdraw to contain their uncomfortable emotions. Women also stonewall, of course, but men are much more likely to resort to this strategy (Baucom & others, 2010).

Now a vicious circle begins. Although stonewalling protects *him* from overwhelming stress and emotion, it creates enormous stress in *her*. She's accustomed to working through emotional problems. And she tends to experience his stonewalling as disapproval and rejection—and sometimes as the ultimate power play. So how does she react to his stonewalling? Frustrated and angry, she now reacts by *flooding*.

When a woman experiences flooding, rather than withdrawing, she intensifies the expression of her emotions. This raises the temperature of the argument to a higher level and creates even more stress in the male, further increasing his urge to withdraw from the situation. In short, this is a very volatile scene. Each partner is exaggerating the frustration and emotional discomfort of the other. Especially in unhappily married couples, Gottman has found that even minor disagreements can quickly escalate in this way, ending up as a no-holds-barred, extremely unpleasant fight.

Breaking the Vicious Circle of Flooding–Stonewalling–Flooding

John Gottman has written or co-written several books to help couples improve their relationships, including *The Science of Trust: Emotional Attunement for Couples* (2011), *10 Lessons to Transform Your Marriage* (2006), and *The Relationship Cure* (2001), all of which we highly recommend for people in all kinds of relationships. Here, we'll summarize five suggestions for handling conflicts in a healthy, constructive manner.

1. Be aware of gender differences.

The first step in breaking the vicious circle of flooding–stonewalling–flooding is to be *aware* of the gender differences in handling emotion. To men, stonewalling is a protective strategy. It represents an attempt to contain disturbing emotions before they become overwhelming and out of control. When women look at men's stonewalling in these terms, they're less likely to interpret it as rejection and as a refusal to try to resolve differences.

For their part, men need to remember that women tend to view stonewalling as rejection, disapproval, and abandonment. Rather than abruptly stonewalling and withdrawing, men need to explain their withdrawal. The explanation can be as simple as saying, "Look, I need to be alone for a while so I can calm down and think about what you're saying. When I come back, we will keep talking." For their part, women need to accept men's need to temporarily withdraw from the situation.

2. Call a time-out.

Gottman (2011) advises that whenever either partner begins to feel overwhelmed or in danger of flooding, he or she should call a *time-out*—a 20- to 30-minute intermission with an agreement to continue the discussion after the break. Remember, it takes at least 20 minutes for physiological arousal to subside completely. Because men are more likely to become emotionally flooded, calming down is especially important for them.

When a man agrees to continue the discussion later and explains why he needs the time-out, his partner is less likely to feel angered and threatened by his withdrawal. As simple as the time-out strategy is, it can promote more constructive and rational discussions, increasing the likelihood that a mutually acceptable solution to the problem will be found.

3. Focus on constructive thoughts.

It is critical that you listen to what you're saying to yourself *during* the time-out. Rather than rehearsing hateful or vengeful comments, use the time-out to focus on calming thoughts about the immediate situation and on positive thoughts about your mate. For example, rather than saying to yourself, "He/she is such a (fill in with an insult)," try saying to yourself, "Calm down and get a grip on things. This *is* basically a good marriage and I *do* love her/him." The important point here is to spend the time-out thinking about ways to *resolve* the conflict, not about ways to mount a more effective counterattack when the battle resumes.

4. Resolve the problem together.

Men need to make a conscious effort to embrace, rather than avoid, the problem at hand. As Gottman (1994) wrote, "The most important advice I can give to men who want their marriages to work is to try *not* to avoid conflict. Sidestepping a problem won't make it go away." In other words, guys, you need to remember that your partner *really* cares about your relationship. That's why she keeps confronting you—so the two of you can resolve the problem *together*.

5. Keep the focus on maintaining the relationship.

Although women should not avoid raising issues that are in need of resolution, they should try to do it calmly, avoiding personal attacks. Gottman advises that issues be framed in the context of maintaining a loving relationship. As Gottman (1994) put it, "It will be much easier for him to stay engaged if you let him know that talking together about what's bothering you is a way to keep the love between you alive."



CHAPTER REVIEW

Gender and Sexuality

KEY POINTS

Introduction: Gender and Sexuality

- Gender and sexuality are important components of everyone's life. The term **sex** refers to the biologically determined physical characteristics that define a person as male or female. **Gender** refers to the cultural, social, and psychological meanings that are associated with masculinity and femininity. **Gender roles** are the behaviors, attitudes, and personality traits designated as either masculine or feminine in a given culture. Gender identity refers to the psychological sense of being male or female, while **sexual orientation** refers to the direction of a person's emotional and erotic attraction.

Gender Stereotypes and Gender Roles

- According to **gender-role stereotypes,** men and women are polar opposites. Research shows that men are more assertive than women and women are more nurturant than men but that men and women are otherwise similar in their personality characteristics.
- On average, women outscore men on tests of verbal fluency, spelling, reading comprehension, and writing. Men outscore women on mental rotation tasks. Average math scores of men and women are very similar, but more men score in the very highest range.
- Men and women are largely similar in their sexual attitudes and behaviors. Men have a higher incidence of masturbation and are more accepting of casual sex than are women.

Gender-Role Development: Blue Bears and Pink Bunnies

- Gender plays an important role in our culture. From birth, boys and girls are treated differently. During childhood, boys and girls develop different toy preferences and play with members of their own sex. Girls tend to be less rigid than boys in adhering to gender stereotypes.
- Two contemporary theories that explain gender-role development are social learning theory and gender schema theory. **Social learning theory of gender-role development** is based on the principles of learning. Through reinforcement, punishment, and modeling, children learn the appropriate behaviors for each gender.
- **Gender schema theory** is based on the idea that children actively develop mental categories for each gender. Children's gender schemas influence what they learn and remember. At a young age, children develop an awareness of the underlying meaning of gender categories.

Human Sexuality

- The four stages of human sexual response are excitement, plateau, orgasm, and resolution. Women are capable of multiple orgasms. Men experience a refractory period following orgasm.
- In nonhuman animals, sexual behavior is biologically determined and typically triggered by hormonal changes in the female. In higher animals, sexual behavior is more strongly influenced by learning and environmental factors and less influenced by biological factors.
- **Sexual orientation** is not as easily categorized as many people think. More people have had some same-sex sexual experience than identify themselves as exclusively homosexual. Although psychologists do not know exactly what determines sexual orientation, genetics and differences in brain structure may be involved. Cross-gender play patterns in childhood seem to be related to a later homosexual orientation. Sexual orientation develops at a fairly early age and is difficult to change. In itself, homosexuality is not considered a psychological disorder.

Sexual Behavior

- Males tend to desire and have more sexual partners than females.
- Most adults are involved in an intimate relationship by the age of 30. Married or cohabiting couples tend to have the most active sex lives and are the most satisfied with their sex lives.
- In late adulthood, people experience physical changes that affect sexual response, but satisfying sexual relationships can continue throughout the lifespan.

Sexual Disorders and Problems

- A **sexual dysfunction** is a consistent disturbance in sexual response that causes psychological distress. Recent research reveals that sexual problems are relatively common in the United States. Either sex can experience **hypoactive sexual desire disorder, sexual aversion disorder,** or **dyspareunia.** Men can experience **erectile dysfunction, male orgasmic disorder,** or **premature ejaculation.** Women can experience **female orgasmic disorder** or **vaginismus.** Sexual dysfunction may be caused by physical or psychological factors.
- The **paraphilias** are unusual sexual fantasies, urges, or behaviors. They may involve nonhuman objects, suffering or humiliation, children, or another nonconsenting adult. Some paraphilias, such as pedophilia and voyeurism, are illegal.
- **Sexually transmitted diseases (STDs)** may be bacterial, viral, or parasitic. Some STDs have vague or nonexistent symptoms and can be unknowingly transmitted to a sex partner. Left untreated, some STDs can cause severe health problems.
- **Genital herpes,** caused by the herpes simplex virus, is a common STD that causes flulike symptoms and painful blisters in the genital and anal regions. Like other STDs, the herpes virus can be contagious even when symptoms are absent. Although there is no cure for herpes, antiviral drugs can prevent or shorten outbreaks of symptoms.
- **AIDS (acquired immune deficiency syndrome)** is caused by the **human immunodeficiency virus (HIV).** After being infected, a person may not develop AIDS for several years but can still infect others. No one is immune to HIV, but people

with multiple sex partners, intravenous drug users and their partners, and gay men are most at risk to contract HIV. Most women are infected through heterosexual intercourse with HIV-positive men.

- The availability of antiretroviral drugs has lowered the death rate from AIDS in the United States and other industrialized countries. However, HIV infection rates and deaths from AIDS are rising throughout the world, especially in Africa, Asia, and eastern Europe.
- People can reduce their chances of contracting a sexually transmitted disease by practicing abstinence, being faithful in a monogamous relationship, and using condoms and spermicides.

KEY TERMS

sex, p. 408
gender, p. 409
gender roles, p. 409
sexual orientation, p. 409
gender-role stereotypes, p. 409
social learning theory of gender-role development, p. 416
intersexed, p. 417
transgendered, p. 417
transsexual, p. 417
gender schema theory, p. 418
sexual dysfunction, p. 431
hypoactive sexual desire disorder, p. 432
sexual aversion disorder, p. 432
dyspareunia, p. 432
erectile dysfunction (ED), p. 432
male orgasmic disorder, p. 432
premature ejaculation, p. 432
female orgasmic disorder, p. 432
vaginismus, p. 432
paraphilia, p. 433
sexually transmitted diseases (STDs), p. 433
genital herpes, p. 434
AIDS (acquired immune deficiency syndrome), p. 434
human immunodeficiency virus (HIV), p. 434

KEY PEOPLE

Sandra Lipsitz Bem (b. 1944) American psychologist who has conducted extensive research on sex roles and gender identity; proposed gender schema theory to explain gender-role development. (p. 416)

Virginia E. Johnson (b. 1925) American behavioral scientist who, along with William H. Masters, conducted pioneering research in the field of human sexuality and sex therapy. (p. 419)

William H. Masters (1915–2001) American physician who, along with Virginia E. Johnson, conducted pioneering research in the field of human sexuality and sex therapy. (p. 419)

CONCEPT REVIEW ANSWERS

10.1 page 418

1. sex
2. gender-role stereotypes
3. social learning theory
4. gender schema theory

10.2 page 426

1. c 2. c 3. a 4. d

10.3 page 437

1. False. Married or cohabiting couples report the most active sex lives.
2. False. The most common sexual behavior for men and women aged 18 to 59 is vaginal intercourse.
3. False. A national survey found that less than 10 percent of the people who tested positive with herpes knew they were infected.
4. True.
5. False. Paraphilias are more common in men.
6. True.
7. False. ABC stands for **A**bstinence, **B**e faithful, and **C**ondoms.
8. True.



Web Companion Review Activities

You can find additional review activities at www.worthpublishers.com/hockenbury6e

The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.

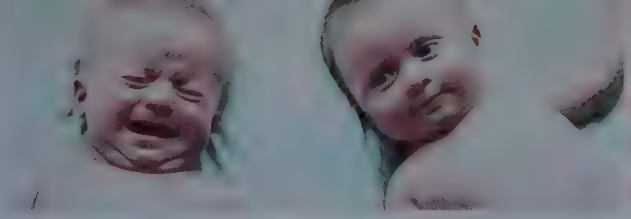




CHAPTER 11

Personality







The Secret Twin

PROLOGUE

THE TWINS, KENNETH AND JULIAN, were born a few years after the turn of the last century. At first, their parents, Gertrude and Henry, thought they were identical. Both had dark hair and deep brown eyes. Many years later, Kenneth's son, your author Don, would inherit these qualities.

But Gertrude and Henry quickly learned to tell the twins apart. Kenneth was slightly larger than Julian, and, even as infants, their personalities were distinctly different. In the photographs of Kenneth and Julian as children, Julian smiles broadly, almost merrily, his head cocked slightly. But Kenneth always looks straight at the camera, his expression thoughtful, serious, more intense.

We don't know much about Julian's childhood. Kenneth kept Julian's existence a closely guarded secret for more than 50 years. In fact, it was only a few years before his own death that Kenneth revealed that he had once had a twin brother named Julian.

Still, it's possible to get glimpses of Julian's early life from the letters the boys wrote home from summer camp in 1919 and 1920. Kenneth's letters to his mother were affectionate and respectful, telling her about their daily activities and reassuring her that he would look after his twin brother. "I reminded Julian about the boats and I will watch him good," Kenneth wrote in one letter. Julian's letters were equally affectionate, but shorter and filled with misspelled words. Julian's letters also revealed glimpses of his impulsive nature. He repeatedly promised his mother, "I will not go out in the boats alone again."

Julian's impulsive nature was to have a significant impact on his life. When he was 12 years old, Julian darted in front of a car and was seriously injured, sustaining a concussion. In retrospect, Kenneth believed that that was when Julian's problems began. Perhaps it was, because not long after the accident Julian got into serious trouble for the first time: He got caught red-handed stealing money from the "poor box" at church.

Although Kenneth claimed that Julian had always been the smarter twin, Julian fell behind in high school and graduated a year later than Kenneth. After high school, Kenneth left the quiet farming community of Grinnell, Iowa, and moved to Minneapolis. He quickly became self-sufficient, taking a job managing newspaper carriers. Julian stayed in Grinnell and became apprenticed to learn typesetting. Given Julian's propensity for adventure, it's not surprising that he found typesetting monotonous. So in the spring of 1928, Julian quit typesetting. He also decided to leave Iowa and head east to look for more interesting possibilities.

IN THIS CHAPTER:

- Introduction: What Is Personality?
- The Psychoanalytic Perspective on Personality
- The Humanistic Perspective on Personality
- The Social Cognitive Perspective on Personality
- The Trait Perspective on Personality
- Assessing Personality: Psychological Tests
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Possible Selves: Imagine the Possibilities

He found them in Tennessee. A few months after Julian left Iowa, Henry received word that Julian had been arrested for armed robbery and sentenced to 15 years in a Tennessee state prison. Though Kenneth was only 22 years old, Henry gave him a large sum of money and the family car and sent him to try to get Julian released.

Kenneth's conversation with the judge in Knoxville was the first of many times that he would deal with the judicial system on someone else's behalf. After much negotiation, the judge agreed: If Julian promised to leave Tennessee and never return, and Kenneth paid the cash "fines," Julian would be released from prison.

When Julian walked through the prison gates the next morning, Kenneth stood waiting with a fresh suit of clothes. "Mother and Father want you to come back to Grinnell," he told Julian. But Julian would not hear of it, saying that instead he wanted to go to California to seek his fortune.

"I can't let you do that, Julian," Kenneth said, looking hard at his twin brother.

"You can't stop me, brother," Julian responded, with a cocky smile. Reluctantly, Kenneth kept just enough money to buy himself a train ticket back to Iowa. He gave Julian the rest of the money and the family car.

Julian got as far as Phoenix, Arizona, before he met his destiny. In broad daylight, he robbed a drugstore at gunpoint. As he backed out of the store, a policeman spotted him. A gun battle followed, and Julian was shot twice. Somehow he managed to escape and holed up in a hotel room. Alone and untended, Julian died two days later from the bullet wounds. Once again, Kenneth was sent to retrieve his twin brother.

On a bitterly cold November morning in 1928, Julian's immediate family laid him to rest in the family plot in Grinnell.



The Twins Julian *(left)* and Kenneth *(right)*, with their father, Henry, when they were about 10 years old. As boys, Kenneth and Julian were inseparable.

Courtesy of Don Hockenbury

On the one hand, Kenneth felt largely responsible for Julian's misguided life. "I should have tried harder to help Julian," Kenneth later reflected. On the other hand, Julian had disgraced the family. From the day Julian was buried, the family never spoke of him again, not even in private.

Kenneth took it upon himself to atone for the failings of his twin brother. In the fall of 1929, he entered law school in Tennessee—the same state from which he had secured Julian's release from prison. Three years later, at the height of the Great Depression, Kenneth established himself as a lawyer in Sioux City, Iowa, where he would practice law for more than 50 years.

As an attorney, Kenneth Hockenbury was known for his integrity, his intensity in the courtroom, and his willingness to take cases regardless of the client's ability to pay. "Someone must defend the poor," he said repeatedly. In lieu of money, he often accepted labor from a working man or produce from farmers.

Almost sixty years after Julian's death, Kenneth died. But unlike the sparse gathering that had attended Julian's burial, scores of people came to pay their last respects to Kenneth Hockenbury. "Your father helped me so much," stranger after stranger told Don at Kenneth's funeral. Without question, Kenneth had devoted his life to helping others.

Why did Kenneth and Julian turn out so differently? Two boys, born on the same day into the same middle-class family. Kenneth the conscientious, serious one; Julian the laughing boy with mischief in his eyes. How can we explain the fundamental differences in their personalities?

No doubt your family, too, is made up of people with very different personalities. By the end of this chapter, you'll have a much greater appreciation for how psychologists explain such personality differences.



Introduction: What Is Personality?

KEY THEME

› Personality is defined as an individual's unique and relatively consistent patterns of thinking, feeling, and behaving.

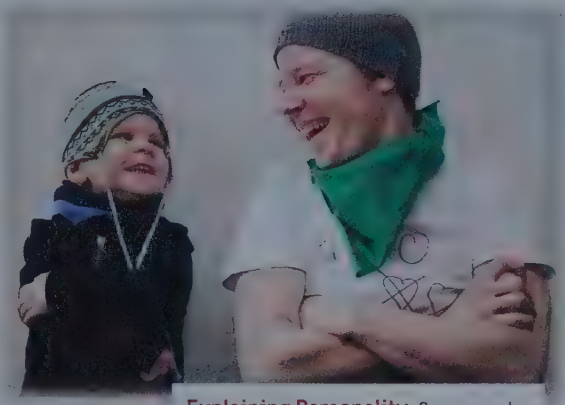
KEY QUESTION

› What are the four major theoretical perspectives on personality?

That you already have an intuitive understanding of the word *personality* is easy to demonstrate. Just from reading this chapter's Prologue, you could easily describe different aspects of Kenneth's and Julian's personalities. Indeed, we frequently toss around the word *personality* in everyday conversations. "He's very competent, but he has an abrasive personality." "She's got such a delightful personality, you can't help liking her."

Your intuitive understanding of personality is probably very similar to the way that psychologists define the concept. **Personality** is defined as an individual's unique and relatively consistent patterns of thinking, feeling, and behaving. A **personality theory** is an attempt to describe and explain how people are similar, how they are different, and why every individual is unique. In short, a personality theory ambitiously tries to explain the *whole person*. At the outset, it's important to stress that no single theory can adequately explain *all* of the aspects of human personality. Every personality theory has its unique strengths and limitations.

Personality theories often reflect the work of a single individual or of a few closely associated individuals. Thus, it's not surprising that many personality theories bear the distinct personal stamp of their creators to a much greater degree than do other kinds of psychological theories. Consequently, we've tried to let the personality theorists speak for themselves. Throughout this chapter, you'll encounter carefully chosen quotations from the theorists' own writings. These quotations will give you brief glimpses into the minds of some of the most influential thinkers in psychology.



ColourisAlamy

Explaining Personality Some people are outgoing, expressive, and fun-loving, like this father and his young son. Other people consistently display the opposite qualities. Are such personality differences due to early childhood experiences? Genetics? Social environment? Personality theories attempt to account for the individual differences that make each one of us unique.

There are many personality theories, but they can be roughly grouped under four basic perspectives: the psychoanalytic, humanistic, social cognitive, and trait perspectives. In a nutshell, here's what each perspective emphasizes:

- The *psychoanalytic perspective* emphasizes the importance of unconscious processes and the influence of early childhood experience.
- The *humanistic perspective* represents an optimistic look at human nature, emphasizing the self and the fulfillment of a person's unique potential.
- The *social cognitive perspective* emphasizes learning and conscious cognitive processes, including the importance of beliefs about the self, goal setting, and self-regulation.
- The *trait perspective* emphasizes the description and measurement of specific personality differences among individuals.

After looking at some of the major personality theories that reflect each perspective, we'll consider a closely related topic—how personality is measured and evaluated. And yes, we'll talk about the famous inkblots. But for the inkblots to make sense, we need to trace the evolution of modern personality theories. We'll begin with the tale of a bearded, cigar-smoking gentleman from Vienna of whom you just may have heard—Sigmund Freud.

The Psychoanalytic Perspective on Personality

KEY THEME

› Freud's psychoanalysis stresses the importance of unconscious forces, sexual and aggressive instincts, and early childhood experience.

KEY QUESTIONS

› What were the key influences on Sigmund Freud's thinking?

› How are unconscious influences revealed?

› What are the three basic structures of personality, and what are the defense mechanisms?

Sigmund Freud, one of the most influential figures of the twentieth century, was the founder of psychoanalysis. **Psychoanalysis** is a theory of personality that stresses the influence of unconscious mental processes, the importance of sexual and aggressive instincts, and the enduring effects of early childhood experience on personality.

personality An individual's unique and relatively consistent patterns of thinking, feeling, and behaving.

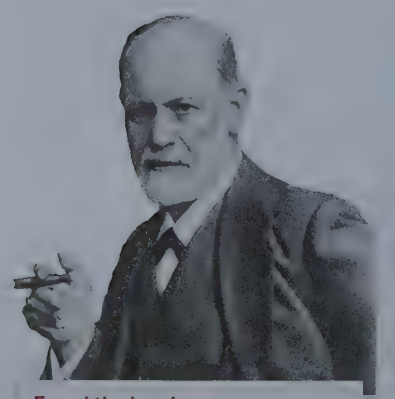
personality theory A theory that attempts to describe and explain similarities and differences in people's patterns of thinking, feeling, and behaving.

psychoanalysis Sigmund Freud's theory of personality, which emphasizes unconscious determinants of behavior, sexual and aggressive instinctual drives, and the enduring effects of early childhood experiences on later personality development.



Mary Evans/Sigmund Freud Copyrights/Photo Researchers

Freud the Outsider Sigmund Freud (1856–1939) is shown with his wife, Martha, and youngest child, Anna, at their Vienna home in 1898. Freud always considered himself to be an outsider. First, he was a Jew at a time when anti-Semitism was strong in Europe. Second, Freud's belief that expressions of sexuality are reflected in the behavior of infants and young children was controversial and shocking to his contemporaries. To some degree, however, Freud enjoyed his role as the isolated scientist—it served him well in trying to set himself, and his ideas on personality, apart from other researchers (Gay, 2006).



Freud the Leader In 1909, Freud visited the United States to lecture on his ideas at Clark University in Massachusetts. A year later, Freud and his many followers founded the International Psychoanalytic Association.

Culver Pictures

Because so many of Freud's ideas have become part of our common culture, it is difficult to imagine just how radical he seemed to his contemporaries. The following biographical sketch highlights some of the important influences that shaped Freud's ideas and theory.

The Life of Sigmund Freud

Sigmund Freud was born in 1856 in what is today Pribor, Czech Republic. When he was 4 years old, his family moved to Vienna, where he lived until the last year of his life. Sigmund was the firstborn child of Jacob and Amalie Freud. By the time he was 10 years old, there were six more siblings in the household. Of the seven children, Sigmund was his mother's favorite. As Freud later wrote, "A man who has been the indisputable favorite of his mother keeps for life the feeling of being a conqueror, that confidence of success that often induces real success" (Jones, 1953).

Freud was extremely intelligent and intensely ambitious. He studied medicine, became a physician, and then proved himself to be an outstanding physiological researcher. Early in his career, Freud was among the first investigators of a new drug that had anesthetic and mood-altering properties—cocaine. However, one of Freud's colleagues received credit for the discovery of the anesthetic properties of cocaine, which left Freud bitter. Adding to his disappointment, Freud's enthusiasm for the medical potential of cocaine quickly faded when he recognized that the drug was addictive (Fancher, 1973; Gay, 2006).

Prospects for an academic career in scientific research were very poor, especially for a Jew in Vienna, which was intensely anti-Semitic at that time. So when he married Martha Bernays in 1886, Freud reluctantly gave up physiological research for a private practice in neurology. The income from private practice would be needed: Sigmund and Martha had six children. One of Freud's daughters, Anna Freud, later became an important psychoanalytic theorist.

Influences in the Development of Freud's Ideas

Freud's theory evolved gradually during his first 20 years of private practice. He based his theory on observations of his patients as well as on self-analysis. An early influence on Freud was Joseph Breuer, a highly respected physician. Breuer described to Freud the striking case of a young woman with an array of puzzling psychological and physical symptoms. Breuer found that if he first hypnotized this patient, then asked her to talk freely about a given symptom, forgotten memories of traumatic events emerged. After she freely expressed the pent-up emotions associated with the event, her symptom disappeared. Breuer called this phenomenon *catharsis* (Freud, 1925).

At first, Freud embraced Breuer's technique, but he found that not all of his patients could be hypnotized. Eventually, Freud dropped the use of hypnosis and developed his own technique of **free association** to help his patients uncover forgotten memories. Freud's patients would spontaneously report their uncensored thoughts, mental images, and feelings as they came to mind. From these "free associations," the thread that led to the crucial long-forgotten memories could be unraveled. Breuer and Freud described several of their case studies in their landmark book, *Studies on Hysteria*. Its publication in 1895 marked the beginning of psychoanalysis.

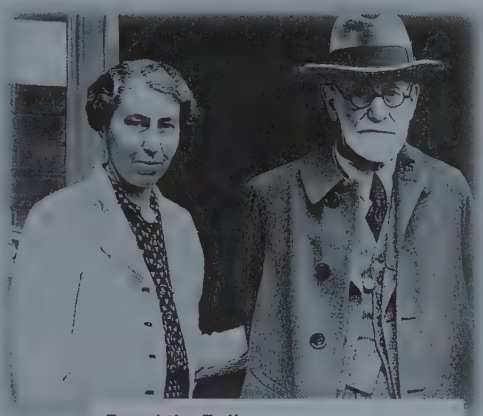
In 1900, Freud published what many consider his most important work, *The Interpretation of Dreams*. By the early 1900s, Freud had developed the basic tenets of his psychoanalytic theory and was no longer the isolated scientist. He was gaining international recognition and developing a following.

In 1904, Freud published what was to become one of his most popular books, *The Psychopathology of Everyday Life*. He described how unconscious thoughts, feelings, and wishes are often reflected in acts of forgetting, inadvertent slips of the tongue, accidents, and errors. By 1909, Freud's influence was also felt in the United States, when he and other psychoanalysts were invited to lecture at Clark

University in Massachusetts. For the next 30 years, Freud continued to refine his theory, publishing many books, articles, and lectures.

The last two decades of Freud's life were filled with many personal tragedies. The terrible devastation of World War I weighed heavily on his mind. In 1920, one of his daughters died. In the early 1920s, Freud developed cancer of the jaw, a condition for which he would ultimately undergo more than 30 operations. And during the late 1920s and early 1930s, the Nazis were steadily gaining power in Germany.

Given the climate of the times, it's not surprising that Freud came to focus on humanity's destructive tendencies. For years he had asserted that sexuality was the fundamental human motive, but now he added aggression as a second powerful human instinct. During this period, Freud wrote *Civilization and Its Discontents* (1930), in which he applied his psychoanalytic perspective to civilization as a whole. The central theme of the book is that human nature and civilization are in basic conflict—a conflict that cannot be resolved.



Corbis

Freud the Exile In the spring of 1938, Freud fled Nazi persecution for the safety of London on the eve of World War II. Four of Freud's sisters who remained behind later died in the Nazi extermination camps. He is shown arriving in England, his eldest daughter, Mathilde, at his side. Freud died in London on September 23, 1939.

Freud's extreme pessimism was undoubtedly a reflection of the destruction he saw all around him. By 1933, Adolf Hitler had seized power in Germany. Freud's books were banned and publicly burned in Berlin. Five years later, the Nazis marched into Austria, seizing control of Freud's homeland. Although Freud's life was clearly threatened, it was only after his youngest daughter, Anna, had been detained and questioned by the *Gestapo* that Freud reluctantly agreed to leave Vienna. Under great duress, Freud moved his family to the safety of England. A year later, his cancer returned. In 1939, Freud died in London at the age of 83 (Gay, 2006).

This brief sketch cannot do justice to the richness of Freud's life and the influence of his culture on his ideas. Today, Freud's legacy continues to influence psychology, philosophy, literature, art, and psychotherapy (Merlino & others, 2008; O'Roark, 2007).

Freud's Dynamic Theory of Personality

Freud (1940) saw personality and behavior as the result of a constant interplay among conflicting psychological forces. These psychological forces operate at three different levels of awareness: the conscious, the preconscious, and the unconscious. All the thoughts, feelings, and sensations that you're aware of at this particular moment represent the *conscious* level. The *preconscious* contains information that you're not currently aware of but can easily bring to conscious awareness, such as memories of recent events or your street address.

However, the conscious and preconscious are merely the visible tip of the iceberg of the mind. The bulk of this psychological iceberg is made up of the **unconscious,** which lies submerged below the waterline of the preconscious and conscious (see Figure 11.1 on the next page). You're not directly aware of these submerged thoughts, feelings, wishes, and drives, but the unconscious exerts an enormous influence on your conscious thoughts and behavior.

Although it is not directly accessible, Freud (1904) believed that unconscious material often seeps through to the conscious level in distorted, disguised, or symbolic forms. Like a detective searching for clues, Freud carefully analyzed his patients' reports of dreams and free associations for evidence of unconscious wishes, fantasies, and conflicts. Dream analysis was particularly important to Freud. "The interpretation of dreams is the royal road to a knowledge of the unconscious activities of the mind," he wrote in *The Interpretation of Dreams* (1900). Beneath the surface images, or *manifest content,* of a dream lies its *latent content*—the true, hidden, unconscious meaning that is disguised in the dream symbols (see Chapter 4).

Freud (1904, 1933) believed that the unconscious can also be revealed in unintentional actions, such as accidents, mistakes, instances of forgetting, and inadvertent slips of the tongue, which are often referred to as "Freudian slips." According to Freud, many seemingly accidental or unintentional actions are not accidental at all, but are determined by unconscious motives.

free association A psychoanalytic technique in which the patient spontaneously reports all thoughts, feelings, and mental images as they come to mind.

unconscious In Freud's theory, a term used to describe thoughts, feelings, wishes, and drives that are operating below the level of conscious awareness.

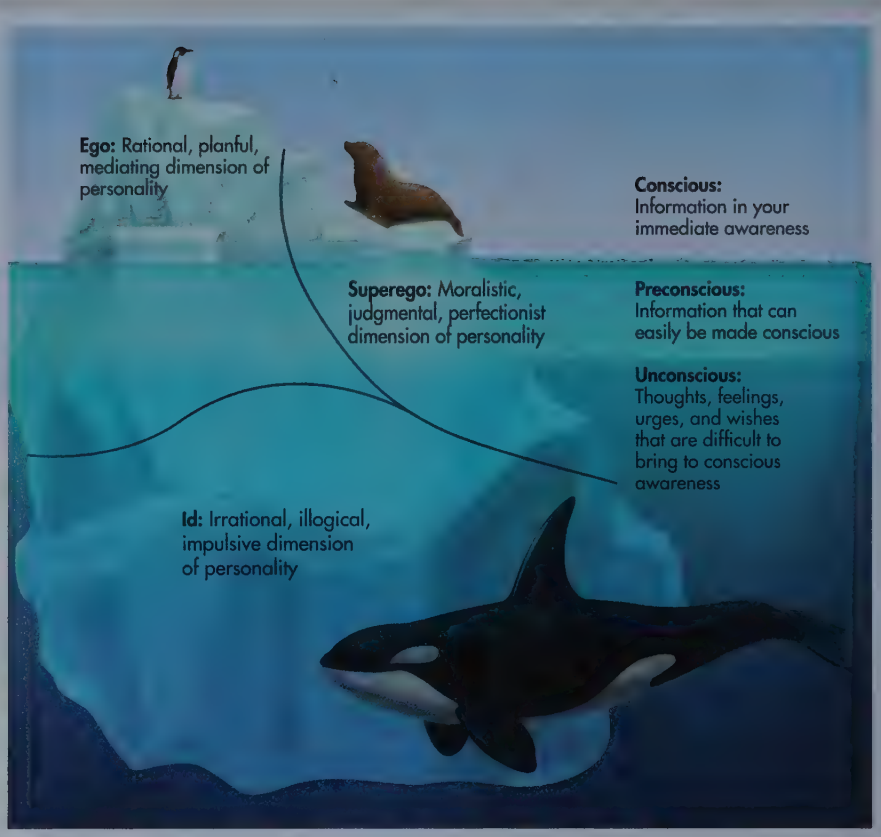


FIGURE 11.1 Levels of Awareness and the Structure of Personality Freud believed that personality is composed of three psychological processes—the id, the ego, and the superego—that operate at different levels of awareness. If you think of personality as being like an iceberg, the bulk of this psychological iceberg is represented by the irrational, impulsive id, which lies beneath the waterline of consciousness. Unlike the entirely unconscious id, the rational ego and the moralistic superego are at least partially conscious.

id Latin for *the it;* in Freud's theory, the completely unconscious, irrational component of personality that seeks immediate satisfaction of instinctual urges and drives; ruled by the pleasure principle.

Eros The self-preservation or life instinct, reflected in the expression of basic biological urges that perpetuate the existence of the individual and the species.

libido The psychological and emotional energy associated with expressions of sexuality; the sex drive.

Thanatos The death instinct, reflected in aggressive, destructive, and self-destructive actions.

pleasure principle The motive to obtain pleasure and avoid tension or discomfort; the most fundamental human motive and the guiding principle of the id.

ego Latin for *I;* in Freud's theory, the partly conscious rational component of personality that regulates thoughts and behavior, and is most in touch with the demands of the external world.

reality principle The capacity to accommodate external demands by postponing gratification until the appropriate time or circumstances exist.

superego In Freud's theory, the partly conscious, self-evaluative, moralistic component of personality that is formed through the internalization of parental and societal rules.

The Structure of Personality

According to Freud (1933), each person possesses a certain amount of psychological energy. This psychological energy develops into the three basic structures of personality—the id, the ego, and the superego (see Figure 11.1). Understand that these are *not* separate identities or brain structures. Rather, they are distinct psychological processes.

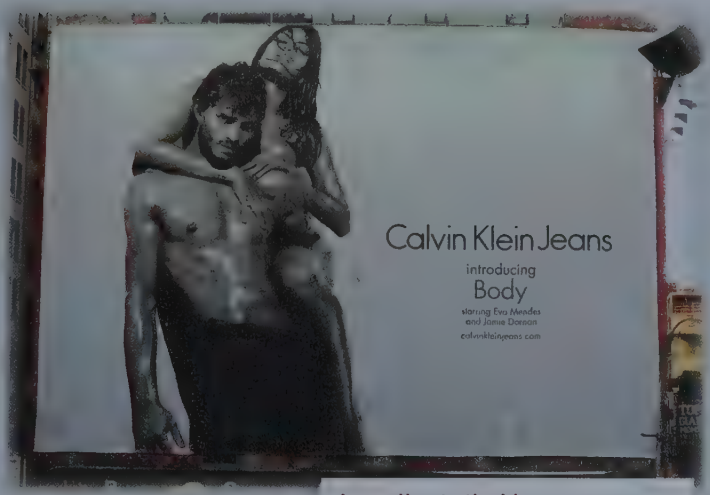
The **id,** the most primitive part of the personality, is entirely unconscious and present at birth. The id is completely immune to logic, values, morality, danger, and the demands of the external world. It is the original source of psychological energy, parts of which will later evolve into the ego and superego (Freud, 1933, 1940). The id is rather difficult to describe in words. "We come nearer to the id with images," Freud (1933) wrote, "and call it a chaos, a cauldron of seething excitement."

The id's reservoir of psychological energy is derived from two conflicting instinctual drives: the life instinct and the death instinct. The *life instinct,* which Freud called **Eros,** consists of biological urges that perpetuate the existence of the individual and the species—hunger, thirst, physical comfort, and, most important, sexuality. Freud (1915c) used the word **libido** to refer specifically to sexual energy or motivation. The *death instinct,* which Freud (1940) called **Thanatos,** is destructive energy that is reflected in aggressive, reckless, and life-threatening behaviors, including self-destructive actions.

The id is ruled by the **pleasure principle**—the relentless drive toward immediate satisfaction of the instinctual urges, especially sexual urges (Freud, 1920). Thus, the id strives to increase pleasure, reduce tension, and avoid pain. Even though it operates unconsciously, Freud saw the pleasure principle as the most fundamental human motive.

Equipped only with the id, the newborn infant is completely driven by the pleasure principle. When cold, wet, hungry, or uncomfortable, the newborn wants his needs addressed immediately. As the infant gains experience with the external world, however, he learns that his caretakers can't or won't always immediately satisfy those needs.

Thus, a new dimension of personality develops from part of the id's psychological energy—the **ego.** Partly conscious, the ego represents the organized, rational, and planning dimensions of personality (Freud, 1933). As the mediator between the id's instinctual demands and the restrictions of the outer world, the ego operates on the reality principle. The **reality principle** is the capacity to postpone gratification until the appropriate time or circumstances exist in the external world (Freud, 1940).



Charles Guerin/Newscom

Appealing to the Id How would Freud explain the appeal of this billboard? In Freud's theory, the id is ruled by the pleasure principle—the instinctual drive to increase pleasure, reduce tension, and avoid pain.

As the young child gains experience, she gradually learns acceptable ways to satisfy her desires and instincts, such as waiting her turn rather than pushing another child off a playground swing. Hence, the ego is the pragmatic part of the personality that learns various compromises to reduce the tension of the id's instinctual urges. If the ego can't identify an acceptable compromise to satisfy an instinctual urge, such as a sexual urge, it can *repress* the impulse, or remove it from conscious awareness (Freud, 1915a).

In early childhood, the ego must deal with external parental demands and limitations. Implicit in those demands are the parents' values and morals, their ideas of the right and wrong ways to think, act, and feel. Eventually, the child encounters other advocates of society's values, such as teachers and religious and legal authorities (Freud, 1926). Gradually, these social values move from being externally imposed demands to being *internalized* rules and values.

By about age 5 or 6, the young child has developed an internal, parental voice that is partly conscious—the **superego.** As the internal representation of parental and societal values, the superego evaluates the acceptability of behavior and thoughts, then praises or admonishes. Put simply, your superego represents your conscience, issuing demands "like a strict father with a child" (Freud, 1926). It judges your own behavior as right or wrong, good or bad, acceptable or unacceptable. And, should you fail to live up to these morals, the superego can be harshly punitive, imposing feelings of inferiority, guilt, shame, self-doubt, and anxiety. If we apply Freud's terminology to the twins described in the chapter Prologue, Kenneth's superego was clearly stronger than Julian's.



Jose Luis Pelaez Inc./age fotostock

Establishing the Superego As children, we learn many rules and values from parents and other authorities. The internalization of such values is what Freud called the superego—the inner voice that is our conscience. When we fail to live up to its moral ideals, the superego imposes feelings of guilt, shame, and inferiority.

The Ego Defense Mechanisms

Unconscious Self-Deceptions

The ego has a difficult task. It must be strong, flexible, and resourceful to successfully mediate conflicts among the instinctual demands of the id, the moral authority of the superego, and external restrictions. According to Freud (1923), everyone experiences an ongoing daily battle among these three warring personality processes.

When the demands of the id or superego threaten to overwhelm the ego, *anxiety* results (Freud, 1915b). If instinctual id impulses overpower the ego, a person may act impulsively and perhaps destructively. Using Freud's terminology, you could say that Julian's id was out of control when he stole from the church and tried to rob the drugstore. In contrast, if superego demands overwhelm the ego, an individual may suffer from guilt, self-reproach, or even suicidal impulses for failing to live up to the superego's moral standards (Freud, 1936). Using Freudian terminology again, it is probably safe to say that Kenneth's feelings of guilt over Julian were inspired by his superego.

If a realistic solution or compromise is not possible, the ego may temporarily reduce anxiety by *distorting* thoughts or perceptions of reality through processes that Freud called **ego defense mechanisms** (Freud, 1946; Freud, 1915c). By resorting to these largely unconscious self-deceptions, the ego can maintain an integrated sense of self while searching for a more acceptable and realistic solution to a conflict between the id and superego.

The most fundamental ego defense mechanism is **repression** (Freud, 1915a, 1936). To some degree, repression occurs in every ego defense mechanism. In simple terms, repression is unconscious forgetting. Unbeknownst to the person, anxiety-producing thoughts, feelings, or impulses are pushed out of conscious awareness into the unconscious. Common examples include traumatic events, past failures, embarrassments, disappointments, the names of disliked people, episodes of physical pain or illness, and unacceptable urges.

Repression, however, is not an all-or-nothing psychological process. As Freud (1939) explained, "The repressed material retains its impetus to penetrate into consciousness." In other words, if you encounter a situation that is very similar to one you've repressed, bits and pieces of memories of the previous situation may begin to resurface. In such instances, the ego may employ other defense mechanisms that allow the urge or information to remain partially conscious.

This is what occurs with the ego defense mechanism of displacement. **Displacement** occurs when emotional impulses are redirected to a substitute object or person, usually one less threatening or dangerous than the original source of conflict (Freud, 1946). For example, an employee angered by a supervisor's unfair treatment may displace his hostility onto family members when he comes home from work. The employee consciously experiences anger but directs it toward someone other than its true target, which remains unconscious.

Freud (1930) believed that a special form of displacement, called *sublimation,* is largely responsible for the productive and creative contributions of people and even of whole societies. **Sublimation** involves displacing sexual urges toward "an aim other than, and remote from, that of sexual gratification" (Freud, 1914). In effect, sublimation channels sexual urges into productive, socially acceptable, nonsexual activities.

The major defense mechanisms are summarized in Table 11.1. In Freud's view, the drawback to using any defense mechanism is that maintaining these self-deceptions requires psychological energy. As Freud (1936) pointed out regarding the most basic defense mechanism, repression does not take place "on a single occasion" but rather demands "a continuous expenditure of effort." Such effort depletes psychological energy that is needed to cope effectively with the demands of daily life.

The use of defense mechanisms is very common. Many psychologically healthy people temporarily use ego defense mechanisms to deal with stressful events. When ego defense mechanisms are used in limited areas and on a short-term basis, psychological energy is not seriously depleted. Ideally, we strive to maintain realistic perceptions of the world and our motives, and search for workable solutions to



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"Look, call it denial if you like, but I think what goes on in my personal life is none of my own damn business."



Tom Cockremlage fotostock

Sublimation In Freud's view, creative or productive behaviors represent the rechanneling of sexual energy, or libido—an ego defense mechanism he termed *sublimation.* Freud believed that civilization's greatest achievements are the result of the sublimation of instinctual energy into socially acceptable activities, like the work of this Cambodian woodcarver. Later personality theorists criticized Freud's refusal to consider creativity a drive in its own right.

TABLE 11.1

The Major Ego Defense Mechanisms

Defense	Description	Example
Repression	The complete exclusion from consciousness of anxiety-producing thoughts, feelings, or impulses; most basic defense mechanism.	Three years after being hospitalized for back surgery, a man can remember only vague details about the event.
Displacement	The redirection of emotional impulses toward a substitute person or object, usually one less threatening or dangerous than the original source of conflict.	Angered by a neighbor's hateful comment, a mother spanks her daughter for accidentally spilling her milk.
Sublimation	A form of displacement in which sexual urges are rechanneled into productive, nonsexual activities.	A graduate student works on her thesis 14 hours a day while her husband is on an extended business trip.
Rationalization	Justifying one's actions or feelings with socially acceptable explanations rather than consciously acknowledging one's true motives or desires.	After being rejected by a prestigious university, a student explains that he is glad because he would be happier at a smaller, less competitive college.
Projection	The attribution of one's own unacceptable urges or qualities to others.	A married woman who is sexually attracted to a co-worker accuses him of flirting with her.
Reaction formation	Thinking or behaving in a way that is the extreme opposite of unacceptable urges or impulses.	Threatened by his awakening sexual attraction to girls, an adolescent boy goes out of his way to tease and torment adolescent girls.
Denial	The failure to recognize or acknowledge the existence of anxiety-provoking information.	Despite having multiple drinks every night, a man says he is not an alcoholic because he never drinks before 5 P.M.
Undoing	A form of unconscious repentance that involves neutralizing or atoning for an unacceptable action or thought with a second action or thought.	A woman who gets a tax refund by cheating on her taxes makes a larger-than-usual donation to the church collection on the following Sunday.
Regression	Retreating to a behavior pattern characteristic of an earlier stage of development.	After her parents' bitter divorce, a 10-year-old girl refuses to sleep alone in her room, crawling into bed with her mother.

conflicts and problems. Using ego defense mechanisms is often a way of buying time while we consciously or unconsciously wrestle with more realistic solutions for whatever is troubling us. But when defense mechanisms delay or interfere with our use of more constructive coping strategies, they can be counterproductive.

Personality Development

The Psychosexual Stages

KEY THEME

› The psychosexual stages are age-related developmental periods, and each stage represents a different focus of the id's sexual energies.

KEY QUESTIONS

› What are the five psychosexual stages, and what are the core conflicts of each stage?

› What is the consequence of fixation?

› What role does the Oedipus complex play in personality development?

According to Freud (1905), people progress through five psychosexual stages of development. The foundations of adult personality are established during the first five years of life, as the child progresses through the *oral, anal,* and *phallic* psychosexual stages. The *latency stage* occurs during late childhood, and the fifth and final stage, the *genital stage,* begins in adolescence.

Each psychosexual stage represents a different focus of the id's sexual energies. Freud (1940) contended that "sexual life does not begin only at puberty, but starts with clear manifestations after birth." This statement is often misinterpreted. Freud was *not* saying that an infant experiences sexual urges in the same way that an adult does. Instead, Freud believed that the infant or young child expresses primitive sexual

ego defense mechanisms Largely unconscious distortions of thoughts or perceptions that act to reduce anxiety.

repression The unconscious exclusion of anxiety-provoking thoughts, feelings, and memories from conscious awareness; the most fundamental ego defense mechanism.

displacement The ego defense mechanism that involves unconsciously shifting the target of an emotional urge to a substitute target that is less threatening or dangerous.

sublimation An ego defense mechanism that involves redirecting sexual urges toward productive, socially acceptable, nonsexual activities; a form of displacement.

urges by seeking sensual pleasure from different areas of the body. Thus, the **psychosexual stages** are age-related developmental periods in which sexual impulses are focused on different bodily zones and are expressed through the activities associated with these areas.

Over the first five years of life, the expression of primitive sexual urges progresses from one bodily zone to another in a distinct order: the mouth, the anus, and the genitals. The first year of life is characterized as the *oral stage*. During this time the infant derives pleasure through the oral activities of sucking, chewing, and biting. During the next two years, pleasure is derived through elimination and acquiring control over elimination—the *anal stage*. In the *phallic stage,* pleasure seeking is focused on the genitals.

Fixation

Unresolved Developmental Conflicts

At each psychosexual stage, Freud (1905) believed, the infant or young child is faced with a developmental conflict that must be successfully resolved in order to move on to the next stage. The heart of this conflict is the degree to which parents either frustrate or overindulge the child's expression of pleasurable feelings. Hence, Freud (1940) believed that parental attitudes and the timing of specific child-rearing events, such as weaning or toilet training, leave a lasting influence on personality development.

If frustrated, the child will be left with feelings of unmet needs characteristic of that stage. If overindulged, the child may be reluctant to move on to the next stage. In either case, the result of an unresolved developmental conflict is *fixation* at a particular stage. The person continues to seek pleasure through behaviors that are similar to those associated with that psychosexual stage. For example, the adult who constantly chews gum, smokes, or bites her fingernails may have unresolved oral psychosexual conflicts.



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"He has a few things to work through, but we're good together."

The Oedipus Complex

A Psychosexual Drama

The most critical conflict that the child must successfully resolve for healthy personality and sexual development occurs during the phallic stage (Freud, 1923, 1940). As the child becomes more aware of pleasure derived from the genital area, Freud believed, the child develops a sexual attraction to the opposite-sex parent and hostility toward the same-sex parent. This is the famous **Oedipus complex,** named after the protagonist of a Greek myth. Abandoned at birth, Oedipus does not know the identity of his parents. As an adult, he unknowingly kills his father and marries his mother.

According to Freud, this attraction to the opposite-sex parent plays out as a sexual drama in the child's mind, a drama with different plot twists for boys and for girls. For boys, the Oedipus complex unfolds as a confrontation with the father for the affections of the mother. The little boy feels hostility and jealousy toward his father, but he realizes that his father is more physically powerful. The boy experiences *castration anxiety,* or the fear that his father will punish him by castrating him (Freud, 1933).

To resolve the Oedipus complex and these anxieties, the little boy ultimately joins forces with his former enemy by resorting to the defense mechanism of **identification.** That is, he imitates and internalizes his father's values, attitudes, and mannerisms. There is, however, one strict limitation in identifying with the father. Only the father can enjoy the sexual affections of the mother. This limitation becomes internalized as a taboo against incestuous urges in the boy's developing superego, a taboo that is enforced by the superego's use of guilt and societal restrictions (Freud, 1905, 1923).

Girls also ultimately resolve the Oedipus complex by identifying with the same-sex parent and developing a strong superego taboo against incestuous urges. But the underlying sexual drama in girls follows different themes. The little girl discovers that little boys have a penis and that she does not. She feels a sense of deprivation and loss that Freud termed *penis envy.*

psychosexual stages In Freud's theory, age-related developmental periods in which the child's sexual urges are focused on different areas of the body and are expressed through the activities associated with those areas.

Oedipus complex In Freud's theory, a child's unconscious sexual desire for the opposite-sex parent, usually accompanied by hostile feelings toward the same-sex parent.

identification In psychoanalytic theory, an ego defense mechanism that involves reducing anxiety by imitating the behavior and characteristics of another person.

According to Freud (1940), the little girl blames her mother for "sending her into the world so insufficiently equipped." Thus, she develops contempt for and resentment toward her mother. However, in her attempt to take her mother's place with her father, she also *identifies* with her mother. Like the little boy, the little girl internalizes the attributes of the same-sex parent.

Freud's views on female sexuality, particularly the concept of penis envy, are among his most severely criticized ideas. Perhaps recognizing that his explanation of female psychosexual development rested on shaky ground, Freud (1926) admitted, "We know less about the sexual life of little girls than of boys. But we need not feel ashamed of this distinction. After all, the sexual life of adult women is a 'dark continent' for psychology."



Koji Aoki/Aflo/Glowimages

Competing with Dad for Mom?
According to Freud, the child identifies with the same-sex parent as a way of resolving sexual attraction toward the opposite-sex parent—the Oedipus complex. Freud believed that imitating the same-sex parent also plays an important role in the development of gender identity and, ultimately, of healthy sexual maturity.

The Latency and Genital Stages

Freud felt that because of the intense anxiety associated with the Oedipus complex, the sexual urges of boys and girls become repressed during the *latency stage* in late childhood. Outwardly, children in the latency stage express a strong desire to associate with same-sex peers, a preference that strengthens the child's sexual identity.

The final resolution of the Oedipus complex occurs in adolescence, during the *genital stage*. As incestuous urges start to resurface, they are prohibited by the moral ideals of the superego as well as by societal restrictions. Thus, the person directs sexual urges toward socially acceptable substitutes, who often resemble the person's opposite-sex parent (Freud, 1905).

In Freud's theory, a healthy personality and sense of sexuality result when conflicts are successfully resolved at each stage of psychosexual development (summarized in Table 11.2). Successfully negotiating the conflicts at each psychosexual stage results in the person's capacity to love and in productive living through one's work, child rearing, and other accomplishments.

> It often happens that a young man falls in love seriously for the first time with a mature woman, or a girl with an elderly man in a position of authority; this is a clear echo of the [earlier] phase of development that we have been discussing. since these figures are able to re-animate pictures of their mother or father.
>
> —*Sigmund Freud (1905)*

TABLE 11.2

Freud's Psychosexual Stages

Age	Stage	Description
Birth to age 1	Oral	The mouth is the primary focus of pleasurable and gratifying sensations, which the infant achieves via feeding and exploring objects with his or her mouth.
Ages 1 to 3	Anal	The anus is the primary focus of pleasurable sensations, which the young child derives through developing control over elimination via toilet training.
Ages 3 to 6	Phallic	The genitals are the primary focus of pleasurable sensations, which the child derives through sexual curiosity, masturbation, and sexual attraction to the opposite-sex parent.
Ages 7 to 11	Latency	Sexual impulses become repressed and dormant as the child develops same-sex friendships with peers and focuses on school, sports, and other activities.
Adolescence	Genital	As the adolescent reaches physical sexual maturity, the genitals become the primary focus of pleasurable sensations, which the person seeks to satisfy in heterosexual relationships.

CONCEPT REVIEW 11.1

Freud's Psychoanalytic Theory

Circle the letter of the correct answer.

1. The id is guided by the _____, and the ego is guided by the _____.
   a. manifest content; latent content
   b. reality principle; pleasure principle
   c. latent content; manifest content
   d. pleasure principle; reality principle

2. Freud developed the method of _____ to help his patients uncover forgotten memories.
   a. hypnosis
   b. catharsis
   c. free association
   d. Thanatos

3. The structure of personality that evaluates the morality of behavior is called the _____.
   a. ego
   b. superego
   c. libido
   d. repression

4. Eight-year-old Johnny wants to be a truck driver when he grows up, just like his dad. Johnny's acceptance of his father's attitudes and values indicates the process of _____.
   a. fixation
   b. identification
   c. denial
   d. projection

5. Every time 4-year-old Felix touches his genitals, his parents call him a "dirty little boy" and slap his hands. According to Freud, Felix's frustration may result in an unresolved developmental conflict called _____.
   a. fixation
   b. identification
   c. sublimation
   d. denial

6. Seven-year-old Carolyn prefers to play with girls and does not like playing with boys very much. Carolyn is probably
   a. anal
   b. phallic
   c. latency
   d. genital

The Neo-Freudians

Freud's Descendants and Dissenters

KEY THEME

› The neo-Freudians followed Freud in stressing the importance of the unconscious and early childhood, but they developed their own personality theories.

KEY QUESTIONS

› How did the neo-Freudians generally depart from Freud's ideas?

› What were the key ideas of Jung, Horney, and Adler?

› What are three key criticisms of Freud's theory and of the psychoanalytic perspective?

Freud's ideas were always controversial. But by the early 1900s, he had attracted a number of followers, many of whom went to Vienna to study with him. Although these early followers developed their own personality theories, they still recognized the importance of many of Freud's basic notions, such as the influence of unconscious processes and early childhood experiences. In effect, they kept the foundations that Freud had established but offered new explanations for personality processes. Hence, these theorists are often called *neo-Freudians* (the prefix *neo* means "new"). The neo-Freudians and their theories are considered part of the psychoanalytic perspective on personality.

In general, the neo-Freudians disagreed with Freud on three key points. First, they took issue with Freud's belief that behavior was primarily motivated by sexual urges. Second, they disagreed with Freud's contention that personality is fundamentally determined by early childhood experiences. Instead, the neo-Freudians believed that personality can also be influenced by experiences throughout the lifespan. Third, the neo-Freudian theorists departed from Freud's generally pessimistic view of human nature and society.

collective unconscious In Jung's theory, the hypothesized part of the unconscious mind that is inherited from previous generations and that contains universally shared ancestral experiences and ideas.

archetypes (AR-kuh-types) In Jung's theory, the inherited mental images of universal human instincts, themes, and preoccupations that are the main components of the collective unconscious.

In Chapter 9, on lifespan development, we described the psychosocial theory of one famous neo-Freudian, Erik Erikson. In this chapter, we'll look at the basic ideas of three other important neo-Freudians: Carl Jung, Karen Horney, and Alfred Adler.

Carl Jung

Archetypes and the Collective Unconscious

Born in a small town in Switzerland, **Carl Jung** (1875–1961) was fascinated by the myths, folktales, and religions of his own and other cultures. After studying medicine, Jung was drawn to the relatively new field of psychiatry because he believed it could provide deeper insights into the human mind (Jung, 1963).

Intrigued by Freud's ideas, Jung began a correspondence with him. At their first meeting, the two men were so compatible that they talked for 13 hours nonstop. Freud felt that his young disciple was so promising that he called him his "adopted son" and his "crown prince." It would be Jung, Freud decided, who would succeed him and lead the international psychoanalytic movement. However, Jung was too independent to relish his role as Freud's unquestioning disciple. As Jung continued to put forth his own ideas, his close friendship with Freud ultimately ended in bitterness (Solomon, 2003).

Jung rejected Freud's belief that human behavior is fueled by the instinctual drives of sex and aggression. Instead, Jung believed that people are motivated by a more general psychological energy that pushes them to achieve psychological growth, self-realization, and psychic wholeness and harmony. Jung (1963) also believed that personality continues to develop in significant ways throughout the lifespan.

In studying different cultures, Jung was struck by the universality of many images and themes, which also surfaced in his patients' dreams and preoccupations. These observations led to some of Jung's most intriguing ideas, the notions of the collective unconscious and archetypes.

Jung (1936) believed that the deepest part of the individual psyche is the **collective unconscious,** which is shared by all people and reflects humanity's collective evolutionary history. He described the collective unconscious as containing "the whole spiritual heritage of mankind's evolution, born anew in the brain structure of every individual" (Jung, 1931).

Contained in the collective unconscious are the **archetypes,** the mental images of universal human instincts, themes, and preoccupations (Jung, 1964). Common archetypal themes that are expressed in virtually every culture are the hero, the powerful father, the nurturing mother, the witch, the wise old man, the innocent child, and death and rebirth.

Two important archetypes that Jung (1951) described are the *anima* and the *animus*—the representations of feminine and masculine qualities. Jung believed that every man has a "feminine" side, represented by his anima, and that every woman has a "masculine" side, represented by her animus. To achieve psychological harmony, Jung believed, it is important for men to recognize and accept their feminine aspects and for women to recognize and accept the masculine side of their nature.

Not surprisingly, Jung's concepts of the collective unconscious and shared archetypes have been criticized as being unscientific or mystical. As far as we know, individual experiences cannot be genetically passed down from one generation to the next. Regardless, Jung's ideas make more sense if you think of the collective unconscious as reflecting shared human experiences. The archetypes, then, can be thought of as symbols that represent the common, universal themes of the human life cycle. These universal themes include birth, achieving a sense of self, parenthood, the spiritual search, and death.

Although Jung's theory never became as influential as Freud's, some of his ideas have gained wide acceptance. For example, Jung (1923) was the first to describe two basic personality types: *introverts,* who focus their attention inward, and *extraverts,* who turn their attention and energy toward the outside world. We will encounter these two basic



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What we properly call instincts are physiological urges, and are perceived by the senses. But at the same time, they also manifest themselves in fantasies and often reveal their presence only by symbolic images. These manifestations are what I call the archetypes. They are without known origin; and they reproduce themselves in any time or in any part of the world.

—*Carl Jung (1964)*



Photofest

Archetypes in Popular Culture

According to Jung, archetypal images are often found in popular myths, novels, and even films. Consider the classic film *The Wizard of Oz.* The motherless child, Dorothy, is on a quest for self-knowledge and selfhood, symbolized by the circular Emerald City. She is accompanied by her symbolic helpers, the Cowardly Lion (seeking courage), the Tin Woodsman (seeking love), and the Scarecrow (seeking wisdom).







The Mandala To Jung (1974), the mandala was the archetypal symbol of the self and psychic wholeness. Mandala images are found in cultures throughout the world. Shown here are a ceremonial buffalo robe of the Plains Indians *(left)*; the Bhavacakra, or Buddhist Wheel of Life, from Tibet *(center)*; and one of many examples from the Christian tradition, a beautiful rose window in the main portal of the Notre Dame cathedral in Reims, France *(right)*.

Courtesy of Dept. of Library Services, American Museum of Natural History. Photo by P. Hollembeak
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Man, [Freud] postulated, is doomed to suffer or destroy.... My own belief is that man has the capacity as well as the desire to develop his potentialities and become a decent human being, and that these deteriorate if his relationship to others and hence to himself is, and continues to be, disturbed. I believe that man can change and go on changing as long as he lives.

–Karen Horney (1945)

personality dimensions again, when we look at trait theories later in this chapter. Finally, Jung's emphasis on the drive toward psychological growth and self-realization anticipated some of the basic ideas of the humanistic perspective on personality, which we'll look at shortly.

Karen Horney

Basic Anxiety and "Womb Envy"

Trained as a Freudian psychoanalyst, **Karen Horney** (1885–1952) (pronounced HORN-eye) emigrated from Germany to the United States during the Great Depression in the 1930s. Horney noticed distinct differences between her American and her German patients. While Freud traced psychological problems to sexual conflicts, Horney found that her American patients were much more worried about their jobs and economic problems than their sex lives. Thus, Horney came to stress the importance of cultural and social factors in personality development—matters that Freud had largely ignored (Horney, 1945).

Horney also stressed the importance of social relationships, especially the parent–child relationship, in the development of personality. She believed that disturbances in human relationships, not sexual conflicts, were the cause of psychological problems. Such problems arise from the attempt to deal with *basic anxiety*, which Horney (1945) described as "the feeling a child has of being isolated and helpless in a potentially hostile world."

Horney (1945) described three patterns of behavior that the individual uses to defend against basic anxiety: moving toward, against, or away from other people. Those who move *toward* other people have an excessive need for approval and affection. Those who move *against* others have an excessive need for power, especially power over other people. They are often competitive, critical, and domineering, and they need to feel superior to others. Finally, those who move *away from* other people have an excessive need for independence and self-sufficiency, which often makes them aloof and detached from others.

Horney contended that people with a healthy personality are *flexible* in balancing these different needs, for there are times when each behavior pattern is appropriate. As Horney (1945) wrote, "One should be capable of giving in to others, of fighting, and keeping to oneself. The three can complement each other and make for a harmonious whole." But when one pattern becomes the predominant way of dealing with other people and the world, psychological conflict and problems can result.

Horney also sharply disagreed with Freud's interpretation of female development, especially his notion that women suffer from penis envy. What women envy in men, Horney (1926) claimed, is not their penis, but their superior status in society. In

fact, Horney contended that men often suffer *womb envy,* envying women's capacity to bear children. Neatly standing Freud's view of feminine psychology on its head, Horney argued that *men* compensate for their relatively minor role in reproduction by constantly striving to make creative achievements in their work (Gilman, 2001; Bayne, 2011). As Horney (1945) wrote, "Is not the tremendous strength in men of the impulse to creative work in every field precisely due to their feelings of playing a relatively small part in the creation of living beings, which constantly impels them to an overcompensation in achievement?"

Horney shared Jung's belief that people are not doomed to psychological conflict and problems. Also like Jung, Horney believed that the drive to grow psychologically and achieve one's potential is a basic human motive.

Alfred Adler

Feelings of Inferiority and Striving for Superiority

Born in Vienna, **Alfred Adler** (1870–1937) was an extremely sickly child. Yet through determination and hard work, he overcame his physical weaknesses. After studying medicine, he became associated with Freud. But from the beginning of Adler's interest in psychoanalysis, he disagreed with Freud on several issues. In particular, Adler placed much more emphasis on the importance of conscious thought processes and social motives. Eventually, Adler broke away from Freud to establish his own theory of personality.

Adler (1933b) believed that the most fundamental human motive is *striving for superiority*—the desire to improve oneself, master challenges, and move toward self-perfection and self-realization. Striving toward superiority arises from universal *feelings of inferiority* that are experienced during infancy and childhood, when the child is helpless and dependent on others. These feelings motivate people to *compensate* for their real or imagined weaknesses by emphasizing their talents and abilities and by working hard to improve themselves. Hence, Adler (1933a) saw the universal human feelings of inferiority as ultimately constructive and valuable.

However, when people are unable to compensate for specific weaknesses or when their feelings of inferiority are excessive, they can develop an *inferiority complex*—a general sense of inadequacy, weakness, and helplessness. People with an inferiority complex are often unable to strive for mastery and self-improvement.

At the other extreme, people can *overcompensate* for their feelings of inferiority and develop a *superiority complex.* Behaviors caused by a superiority complex might include exaggerating one's accomplishments and importance in an effort to cover up weaknesses and denying the reality of one's limitations (Adler, 1954).

Like Horney, Adler believed that humans were motivated to grow and achieve their personal goals. And, like Horney, Adler emphasized the importance of cultural influences and social relationships (Carlson & others, 2008; Dufrene, 2011).



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To be a human being means to have inferiority feelings. One recognizes one's own powerlessness in the face of nature. One sees death as the irrefutable consequence of existence. But in the mentally healthy person this inferiority feeling acts as a motive for productivity, as a motive for attempting to overcome obstacles, to maintain oneself in life.

–Alfred Adler (1933a)

CONCEPT REVIEW 11.2

Psychoanalytic Theorists

Which psychoanalytic theorist made each of the following statements?

1. _____ "The interpretation of dreams is the royal road to a knowledge of the unconscious activities of the mind."
2. _____ "My own belief is that man has the capacity as well as the desire to develop his potentialities and become a decent human being, and that these deteriorate if his relationship to others and hence to himself is, and continues to be, disturbed."
3. _____ "To be human means to have inferiority feelings."
4. _____ "The whole spiritual heritage of mankind's evolution [is] born anew in the brain structure of every individual."
5. _____ "Sexual life does not begin only at puberty, but starts with clear manifestations after birth."
6. _____ "One should be capable of giving in to others, of fighting, and of keeping to oneself. The three can complement each other and make for a harmonious whole."



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A Century of Influence One indicator of Freud's influence is that he appeared on the cover of *Time* magazine four different times—in 1924, just before his death in 1939, in 1993, and again in 1999. The 1999 cover shown here, a caricature of Freud psychoanalyzing Albert Einstein, was a special issue of *Time* commemorating the 100 greatest scientists and thinkers of the twentieth century.

Evaluating Freud and the Psychoanalytic Perspective on Personality

Like it or not, Sigmund Freud's ideas have had a profound and lasting impact on our culture and on our understanding of human nature (see Merlino & others, 2008). Today, opinions on Freud span the entire spectrum. Some see him as a genius who discovered brilliant, lasting insights into human nature. Others contend that Freud was a deeply neurotic, driven man who successfully foisted his twisted personal view of human nature onto an unsuspecting public (Crews, 1984, 1996, 2006).

The truth, as you might suspect, lies somewhere in between. Although Freud has had an enormous impact on psychology and on society, there are several valid criticisms of Freud's theory and, more generally, of the psychoanalytic perspective. We'll discuss three of the most important problems next.

Inadequacy of Evidence

Freud's theory relies wholly on data derived from his relatively small number of patients and from self-analysis. Most of Freud's patients were relatively well-to-do, well-educated members of the middle and upper classes in Vienna at the beginning of the twentieth century. Freud (1916, 1919, 1939) also analyzed the lives of famous historical figures, such as Leonardo da Vinci, and looked to myth, religion, literature, and evolutionary prehistory for confirmation of his ideas. Any way you look at it, this is a small and rather skewed sample from which to draw sweeping generalizations about human nature.

Furthermore, it is impossible to objectively assess Freud's "data." Freud did not take notes during his private therapy sessions. And, of course, when Freud did report a case in detail, it was still his own interpretation of the case that was recorded. For Freud, proof of the validity of his ideas depended on his uncovering similar patterns in different patients. So the critical question is this: Was Freud imposing his own ideas onto his patients, seeing only what he expected to see? Some critics think so (e.g., Grünbaum, 2006, 2007).

Lack of Testability

Many psychoanalytic concepts are so vague and ambiguous that they are impossible to objectively measure or confirm (Crews, 2006; Grünbaum, 2006). For example, how might you go about proving the existence of the id or the superego? Or how could you operationally define and measure the effects of the pleasure principle, the life instinct, or the Oedipus complex?

Psychoanalytic "proof" often has a "heads I win, tails you lose" style to it. In other words, psychoanalytic concepts are often impossible to *dis*prove because even seemingly contradictory information can be used to support Freud's theory. For example, if your memory of childhood doesn't jibe with Freud's description of the psychosexual stages or the Oedipus complex, well, that's because you've repressed it. Freud himself was not immune to this form of reasoning (Robinson, 1993). When one of Freud's patients reported dreams that didn't seem to reveal a hidden wish, Freud interpreted the dreams as betraying the patient's hidden wish to disprove Freud's dream theory!

As Freud acknowledged, psychoanalysis is better at explaining *past* behavior than at predicting future behavior (Gay, 1989). Indeed, psychoanalytic interpretations are so flexible that a given behavior can be explained by any number of completely different motives. For example, a man who is extremely affectionate toward his wife might be exhibiting displacement of a repressed incestuous urge (he is displacing his repressed affection for his mother onto his wife), reaction formation (he actually hates his wife intensely, so he compensates by being overly affectionate), or fixation at the oral stage (he is overly dependent on his wife).

For good or ill, Sigmund Freud, more than any other explorer of the psyche, has shaped the mind of the 20th century. The very fierceness and persistence of his detractors are a wry tribute to the staying power of Freud's ideas.

—Peter Gay (1999)

Step by step, we are learning that Freud has been the most overrated figure in the entire history of science and medicine—one who wrought immense harm through the propagation of false etiologies, mistaken diagnoses, and fruitless lines of inquiry.

—Frederick Crews (2006)

Nonetheless, several key psychoanalytic ideas *have* been substantiated by empirical research (Cogan & others, 2007; Westen, 1990, 1998). Among these are the ideas that (1) much of mental life is unconscious; (2) early childhood experiences have a critical influence on interpersonal relationships and psychological adjustment; and (3) people differ significantly in the degree to which they are able to regulate their impulses, emotions, and thoughts toward adaptive and socially acceptable ends.

Sexism

Many people feel that Freud's theories reflect a sexist view of women. Because penis envy produces feelings of shame and inferiority, Freud (1925) claimed, women are more vain, masochistic, and jealous than men. He also believed that women are more influenced by their emotions and have a lesser ethical and moral sense than men.

As Horney and other female psychoanalysts have pointed out, Freud's theory uses male psychology as a prototype. Women are essentially viewed as a deviation from the norm of masculinity (Horney, 1926; Thompson, 1950). Perhaps, Horney suggested, psychoanalysis would have evolved an entirely different view of women if it were not dominated by the male point of view.

To Freud's credit, women were quite active in the early psychoanalytic movement. Several female analysts became close colleagues of Freud (Freeman & Strean, 1987; Roazen, 1999, 2000). And, it was Freud's daughter Anna, rather than any of his sons, who followed in his footsteps as an eminent psychoanalyst. Ultimately, Anna Freud became her father's successor as leader of the international psychoanalytic movement.

The weaknesses in Freud's theory and in the psychoanalytic approach to personality are not minor problems. All the same, Freud made some extremely significant contributions to modern psychological thinking. Most important, he drew attention to the existence and influence of mental processes that occur outside conscious awareness, an idea that continues to be actively investigated by today's psychological researchers.



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Anna Freud (1895–1982) Freud's youngest daughter, Anna, became his chief disciple and was herself the founder of a psychoanalytic school. Expanding on her father's theory, she applied psychoanalysis to therapy with children. She is shown here addressing a debate on psychoanalysis at the Sorbonne University in Paris in 1950.

The Humanistic Perspective on Personality

KEY THEME

› The humanistic perspective emphasizes free will, self-awareness, and psychological growth.

KEY QUESTIONS

› What role do the self-concept, actualizing tendency, and unconditional positive regard play in Rogers's personality theory?

› What are key strengths and weaknesses of the humanistic perspective?

By the 1950s, the field of personality was dominated by two completely different perspectives: Freudian psychoanalysis and B. F. Skinner's brand of behaviorism (see Chapter 5). While Freud's theory of personality proposed elaborate and complex internal states, Skinner believed that psychologists should focus on observable behaviors and on the environmental factors that shape and maintain those behaviors (see Rogers & Skinner, 1956). As Skinner (1971) wrote, "A person does not act upon the world, the world acts upon him."

The Emergence of the "Third Force"

Another group of psychologists had a fundamentally different view of human nature. In opposition to both psychoanalysis and behaviorism, they championed a "third force" in psychology, which they called humanistic psychology. **Humanistic psychology** is a view of personality that emphasizes human potential and such uniquely human characteristics as self-awareness and free will (Cain, 2002).

humanistic psychology The theoretical viewpoint on personality that generally emphasizes the inherent goodness of people, human potential, self-actualization, the self-concept, and healthy personality development.

In contrast to Freud's pessimistic view of people as being motivated by unconscious sexual and destructive instincts, the humanistic psychologists saw people as being innately good. Humanistic psychologists also differed from psychoanalytic theorists by their focus on the *healthy* personality rather than on psychologically troubled people.

In contrast to the behaviorist view that human and animal behavior is due largely to environmental reinforcement and punishment, the humanistic psychologists believed that people are motivated by the need to grow psychologically. They also doubted that laboratory research with rats and pigeons accurately reflected the essence of human nature, as the behaviorists claimed. Instead, humanistic psychologists contended that the most important factor in personality is the individual's *conscious, subjective perception of his or her self* (Purkey & Stanley, 2002).

The two most important contributors to the humanistic perspective were Carl Rogers and Abraham Maslow. In Chapter 8, on motivation, we discussed **Abraham Maslow**'s famous *hierarchy of needs* and his concept of self-actualization. Like Maslow, Rogers emphasized the tendency of human beings to strive to fulfill their potential and capabilities (Kirschenbaum, 2004; Kirschenbaum & Jourdan, 2005).



Courtesy of Carl Rogers Memorial Library

At bottom, each person is asking, "Who am I, really? How can I get in touch with this real self, underlying all my surface behavior? How can I become myself?"

—Carl Rogers (1961)

Carl Rogers

On Becoming a Person

Carl Rogers (1902–1987) grew up in a large, close-knit family in Oak Park, Illinois, a suburb of Chicago. His parents were highly religious and instilled a moral and ethical atmosphere in the home, which no doubt influenced Rogers's early decision to become a minister. After studying theology, Rogers decided that the ministry was not for him. Instead, he turned to the study of psychology, ultimately enjoying a long, productive, and distinguished career as a psychotherapist, writer, and university professor.

Like Freud, Rogers developed his personality theory from his clinical experiences with his patients. Rogers referred to his patients as "clients" to emphasize their active and voluntary participation in therapy. In marked contrast to Freud, Rogers was continually impressed by his clients' drive to grow and develop their potential.

These observations convinced Rogers that the most basic human motive is the **actualizing tendency**—the innate drive to maintain and enhance the human organism (Bohart, 2007; Bozarth & Wang, 2008). According to Rogers, all other human motives, whether biological or social, are secondary. He compared the actualizing tendency to a child's drive to learn to walk despite early frustration and falls. To get a sense of the vastly different views of Rogers and Freud, read the Critical Thinking box "Freud Versus Rogers on Human Nature."

The Self-Concept

Rogers (1959) was struck by how frequently his clients in therapy said, "I'm not really sure who I am" or "I just don't feel like myself." This observation helped form the cornerstone of Rogers's personality theory: the idea of the self-concept. The **self-concept** is the set of perceptions and beliefs that you have about yourself, including your nature, your personal qualities, and your typical behavior.

According to Rogers (1980), people are motivated to act in accordance with their self-concept. So strong is the need to maintain a consistent self-concept that people will deny or distort experiences that contradict their self-concept.

The self-concept begins evolving early in life. Because they are motivated by the actualizing tendency, infants and young children naturally gravitate toward self-enhancing experiences. But as children develop greater self-awareness, there is an increasing need for positive regard. *Positive regard* is the sense of being loved and valued by other people, especially one's parents (Bozarth, 2007; Farber & Doolin, 2011).

actualizing tendency In Rogers's theory, the innate drive to maintain and enhance the human organism.

self-concept The set of perceptions and beliefs that you hold about yourself.

CRITICAL THINKING

Freud Versus Rogers on Human Nature

Freud's view of human nature was deeply pessimistic. He believed that the human aggressive instinct was innate, persistent, and pervasive. Were it not for internal superego restraints and external societal restraints, civilization as we know it would collapse: The destructive instincts of humans would be unleashed. As Freud (1930) wrote in *Civilization and Its Discontents:*

> Men are not gentle creatures who want to be loved, and who at the most can defend themselves if they are attacked; they are, on the contrary, creatures among whose instinctual endowments is to be reckoned a powerful share of aggressiveness. As a result, their neighbor is for them not only a potential helper or sexual object, but also someone who tempts them to satisfy their aggressiveness on him, to exploit his capacity for work without compensation, to use him sexually without his consent, to seize his possessions, to humiliate him, to cause him pain, to torture and to kill him. *Man is a wolf to man.* Who, in the face of all his experience of life and of history, will have the courage to dispute this assertion?

In Freud's view, then, the essence of human nature is destructive. Control of these destructive instincts is necessary. Yet societal, cultural, religious, and moral restraints also make people frustrated, neurotic, and unhappy. Why? Because the strivings of the id toward instinctual satisfaction *must* be frustrated if civilization and the human race are to survive. Hence, as the title of Freud's book emphasizes, civilization is inevitably accompanied by human "discontent."

A pretty gloomy picture, isn't it? Yet if you watch the evening news or read the newspaper, you may find it hard to disagree with Freud's negative image of human nature. People *are* often exceedingly cruel and selfish, committing horrifying acts of brutality against strangers and even against loved ones.

However, you might argue that people can also be extraordinarily kind, self-sacrificing, and loving toward others. Freud would agree with this observation. Yet according to his theory, "good" or "moral" behavior does not disprove the essentially destructive nature of people. Instead, he explains good or moral behavior in terms of superego control, sublimation of the instincts, displacement, and so forth.

But is this truly the essence of human nature? Carl Rogers disagreed strongly. "I do not discover man to be well characterized in his basic nature by such terms as *fundamentally hostile, antisocial, destructive, evil,*" Rogers (1957a) wrote. Instead, Rogers believed that people are more accurately described as *"positive, forward-moving, constructive, realistic, trustworthy."*

If this is so, how can Rogers account for the evil and cruelty in the world? Rogers didn't deny that people can behave destructively and cruelly. Yet throughout his life, Rogers insisted that people are innately good. Rogers (1981) explained the existence of evil in this way:

> My experience leads me to believe that it is cultural factors which are the major factor in our evil behaviors. The rough manner of childbirth, the infant's mixed experience with the parents, the constricting, destructive influence of our educational system, the injustice of our distribution of wealth, our cultivated prejudices against individuals who are different—all these elements and many others warp the human organism in directions which are antisocial.

In sharp contrast to Freud, Rogers (1964) said we should *trust* the human organism because the human who is truly free to choose will naturally gravitate toward behavior that serves to perpetuate the human race and improve society as a whole:

> I dare to believe that when the human being is inwardly free to choose whatever he deeply values, he tends to value those objects, experiences, and goals that will make for his own survival, growth, and development, and for the survival and development of others. . . . The psychologically mature person as I have described him has, I believe, the qualities which would cause him to value those experiences which would make for the survival and enhancement of the human race.

Two great thinkers, two diametrically opposed views of human nature. Now it's your turn to critically evaluate their views.



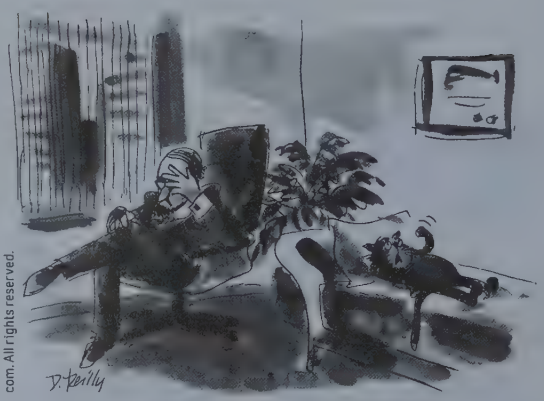
Kate Geraghty/Sydney Morning Herald/Getty Images

Are People Innately Good . . . or Innately Evil? This Australian nurse is a member of Doctors Without Borders, an international group of medical workers that won the Nobel Peace Prize for its work in helping the victims of violence and disasters all over the world. Years of warfare in South Sudan have displaced millions of people, creating a humanitarian crisis. Here, the nurse examines a sick infant at a refugee camp.

On the one hand, violence motivated by political or ethnic hatred seems to support Freud's contentions about human nature. On the other hand, the selfless behavior of those who help others, often at a considerable cost to themselves, seems to support Rogers's view. Which viewpoint do you think more accurately describes the essence of human nature?

CRITICAL THINKING QUESTIONS

- Are people inherently driven by aggressive instincts, as Freud claimed? Must the destructive urges of the id be restrained by parents, culture, religion, and society if civilization is to continue? Would an environment in which individuals were unrestrained inevitably lead to an unleashing of destructive instincts?
- Or are people naturally good, as Rogers claimed? If people existed in a truly free and nurturing environment, would they invariably make constructive choices that would benefit both themselves and society as a whole?



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"To this day, I can hear my mother's voice—harsh, accusing. 'Lost your mittens? You naughtly kittens! Then you shall have no pie!'"

Rogers (1959) maintained that most parents provide their children with **conditional positive regard**—the sense that the child is valued and loved only when she behaves in a way that is acceptable to others. The problem with conditional positive regard is that it causes the child to learn to deny or distort her genuine feelings. For example, if little Amy's parents scold and reject her when she expresses angry feelings, her strong need for positive regard will cause her to deny her anger, even when it's justified or appropriate. Eventually, Amy's self-concept will become so distorted that genuine feelings of anger are denied because they are inconsistent with her self-concept as "a good girl who never gets angry." Because of the fear of losing positive regard, she cuts herself off from her true feelings.

Like Freud, Rogers believed that feelings and experiences could be driven from consciousness by being denied or distorted. But Rogers believed that feelings become denied or distorted not because they are threatening but because they contradict the self-concept. In this case, people are in a state of *incongruence:* Their self-concept conflicts with their actual experience (Rogers, 1959). Such a person is continually defending against genuine feelings and experiences that are inconsistent with his self-concept. As this process continues over time, a person progressively becomes more "out of touch" with his true feelings and his essential self, often experiencing psychological problems as a result.

How is incongruence to be avoided? In the ideal situation, a child experiences a great deal of unconditional positive regard from parents and other authority figures. **Unconditional positive regard** refers to the child's sense of being unconditionally loved and valued, even if she doesn't conform to the standards and expectations of others. In this way, the child's actualizing tendency is allowed its fullest expression. However, Rogers did *not* advocate permissive parenting. He thought that parents were responsible for controlling their children's behavior and for teaching them acceptable standards of behavior. Rogers maintained that parents can discipline their child without undermining the child's sense of self-worth.

For example, parents can disapprove of a child's specific *behavior* without completely rejecting the *child herself.* In effect, the parent's message should be, "I do not value your behavior right now, but I still love and value *you.*" In this way, according to Rogers, the child's essential sense of self-worth can remain intact.



Bill Aron/Photo Edit

Unconditional Positive Regard

Rogers contended that healthy personality development is the result of being unconditionally valued and loved as a person (Bozarth, 2007). He advised parents and teachers to control a child's inappropriate behavior without rejecting the child himself. Such a style of discipline teaches acceptable behaviors without diminishing the child's sense of self-worth.

Rogers (1957b) believed that it is through consistent experiences of unconditional positive regard that one becomes a psychologically healthy, fully functioning person. The *fully functioning person* has a flexible, constantly evolving self-concept. She is realistic, open to new experiences, and capable of changing in response to new experiences.

Rather than defending against or distorting her own thoughts or feelings, the person experiences *congruence:* Her sense of self is consistent with her emotions and experiences (Farber, 2007). The actualizing tendency is fully operational, and she makes choices that move her in the direction of greater growth and fulfillment of potential. Rogers (1957b, 1964) believed that the fully functioning person is likely to be creative and spontaneous, and to enjoy harmonious relationships with others.

Evaluating the Humanistic Perspective on Personality

The humanistic perspective has been criticized on two particular points. First, humanistic theories are hard to validate or test scientifically. Humanistic theories tend to be based on philosophical assumptions or clinical observations rather than on empirical research. For example, concepts like the self-concept, unconditional positive regard, and the actualizing tendency are very difficult to define or measure objectively.

Second, many psychologists believe that humanistic psychology's view of human nature is *too* optimistic. For example, if self-actualization is a universal human motive, why

are self-actualized people so hard to find? And, critics claim, humanistic psychologists have minimized the darker, more destructive side of human nature. Can we really account for all the evil in the world by attributing it to a restrictive upbringing or society?

The influence of humanistic psychology has waned since the 1960s and early 1970s (Cain, 2003). Nevertheless, it has made lasting contributions, especially in the realms of psychotherapy, counseling, education, and parenting (Farber, 2007). The humanistic perspective has also promoted the scientific study of such topics as the healthy personality and creativity. Finally, the importance of subjective experience and the self-concept has become widely accepted in different areas of psychology (Sheldon, 2008; Sleeth, 2007).

I am quite aware that out of defensiveness and inner fear individuals can and do behave in ways which are incredibly cruel, horribly destructive, immature, regressive, antisocial, and hurtful. Yet one of the most refreshing and invigorating parts of my experience is to work with such individuals and to discover the strongly positive directional tendencies which exist in them, as in all of us, at the deepest levels

—Carl Rogers (1961)

The Social Cognitive Perspective on Personality

KEY THEME

› The social cognitive perspective stresses conscious thought processes, self-regulation, and the importance of situational influences.

KEY QUESTIONS

› What is the principle of reciprocal determination?

› What is the role of self-efficacy beliefs in personality?

› What are the key strengths and weaknesses of the social cognitive perspective?

conditional positive regard In Rogers's theory, the sense that you will be valued and loved only if you behave in a way that is acceptable to others; conditional love or acceptance.

unconditional positive regard In Rogers's theory, the sense that you will be valued and loved even if you don't conform to the standards and expectations of others; unconditional love or acceptance.

Have you ever noticed how different your behavior and sense of self can be in different situations? Consider this example: You feel pretty confident as you enter your English composition class. After all, you're pulling an A, and your prof nods approvingly every time you participate in the class discussion, which you do frequently. In contrast, your college algebra class is a disaster. You're worried about passing the course, and you feel so shaky about your skills that you're afraid to even ask a question, much less participate in class. Even a casual observer would notice how differently you behave in the two different situations—speaking freely and confidently in one class, staring at your desk in hopes that your instructor won't notice you in the other.

The idea that a person's conscious thought processes in different situations strongly influence his or her actions is one important characteristic of the *social cognitive perspective* on personality (Cervone & others, 2011). According to the social cognitive perspective, people actively process information from their social experiences. This information influences their goals, expectations, beliefs, and behavior, as well as the specific environments they choose.

The social cognitive perspective differs from psychoanalytic and humanistic perspectives in several ways. First, rather than basing their approach on self-analysis or insights derived from psychotherapy, social cognitive personality theorists rely heavily on experimental findings. Second, the social cognitive perspective emphasizes conscious, self-regulated behavior rather than unconscious mental influences and instinctual drives. And third, as in our English-versus-algebra-class example, the social cognitive approach emphasizes that our sense of self can vary, depending on our thoughts, feelings, and behaviors in a given situation.



Courtesy of Albert Bandura

The capacity to exercise control over the nature and quality of life is the essence of humanness. Unless people believe they can produce desired results and forestall detrimental ones by their actions, they have little incentive to act or persevere in the face of difficulties.

—Albert Bandura (2001)

Albert Bandura and Social Cognitive Theory

Although several contemporary personality theorists have embraced the social cognitive approach to explaining personality, probably the most influential is **Albert Bandura** (b. 1925). We examined Bandura's classic research on *observational learning* in Chapter 5. In Chapter 8, we encountered Bandura's more recent research on self-efficacy. Here, you'll see how Bandura's ideas on both these topics are reflected in his

social cognitive theory Albert Bandura's theory of personality, which emphasizes the importance of observational learning, conscious cognitive processes, social experiences, self-efficacy beliefs, and reciprocal determinism.

reciprocal determinism A model proposed by psychologist Albert Bandura that explains human functioning and personality as caused by the interaction of behavioral, cognitive, and environmental factors.

self-efficacy The beliefs that people have about their ability to meet the demands of a specific situation; feelings of self-confidence or self-doubt.

personality theory, called social cognitive theory. **Social cognitive theory** emphasizes the social origins of thoughts and actions but also stresses active cognitive processes and the human capacity for *self*-regulation (Bandura, 2004b, 2006).

As Bandura's early research demonstrated, we learn many behaviors by observing, and then imitating, the behavior of other people. But, as Bandura (1997) has pointed out, we don't merely observe people's actions. We also observe the *consequences* that follow people's actions, the *rules* and *standards* that apply to behavior in specific situations, and the ways in which people *regulate their own behavior.* Thus, environmental influences are important, but conscious, self-generated goals and standards also exert considerable control over thoughts, feelings, and actions (Bandura, 2001).

For example, consider your own goal of getting a college education. No doubt many social and environmental factors influenced your decision. In turn, your conscious decision to attend college determines many aspects of your current behavior, thoughts, and emotions. And your goal of attending college classes determines which environments you choose.

Bandura (1986, 1997) explains human behavior and personality as being caused by the interaction of behavioral, cognitive, and environmental factors. He calls this process **reciprocal determinism** (see Figure 11.2). According to this principle, each factor both influences the other factors and is influenced by the other factors. Thus, in Bandura's view, our environment influences our thoughts and actions, our thoughts influence our actions and the environments we choose, our actions influence our thoughts and the environments we choose, and so on in a circular fashion.

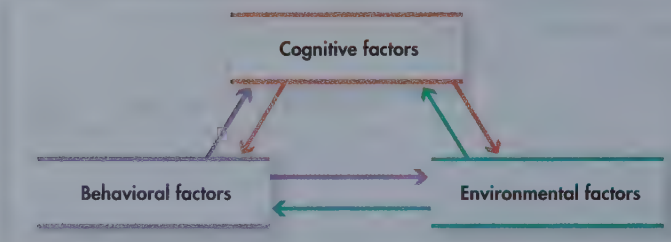


FIGURE 11.2 Reciprocal Determinism

Source: Bandura (1997).

Beliefs of Self-Efficacy

Anybody Here Know How to Fix a Light Switch?

Collectively, a person's cognitive skills, abilities, and attitudes represent the person's *self-system.* According to Bandura (2001), it is our self-system that guides how we perceive, evaluate, and control our behavior in different situations. Bandura (2004b) has found that the most critical elements influencing the self-system are our beliefs of self-efficacy. **Self-efficacy** refers to the degree to which you are subjectively convinced of your own capabilities and effectiveness in meeting the demands of a particular situation.

For example, your authors, Don and Sandy, are at opposite ends of the spectrum in their beliefs of self-efficacy when it comes to repairs around the house. Don thinks he can fix anything, whether he really can or not. Sandy likes to describe herself as "mechanically challenged." When a light switch broke in our house, it was obvious that Sandy had very little faith in her ability to fix or replace it: She instantly hollered for help. As Don investigated the matter, he casually asked Sandy whether *she* could replace the light switch.

"Me? You must be kidding," Sandy immediately responded. "It would never occur to me to even *try* to replace a light switch."

Bandura would be quick to point out how Sandy's weak belief of self-efficacy about electrical repairs guides her behavior—it would prevent her from even attempting to fix a light switch on her own. When Don reassured Sandy that the directions were right on the light-switch package and that it was a very simple task, Sandy still expressed strong self-doubt about her abilities. "I'd probably blow up the house or burn it down or black out the whole neighborhood," she said.

Albert Bandura would, no doubt, smile at how readily Sandy's remark was an everyday confirmation of his research finding that our beliefs of self-efficacy help shape our imagination of future consequences (Bandura, 1992; Ozer & Bandura, 1990). In Sandy's case, her weak belief of self-efficacy contributed to her imagination of dire future consequences should she attempt this task.



Jutta Klee/Photolibrary

Self-Efficacy We acquire a strong sense of self-efficacy by meeting challenges and mastering new skills specific to a particular situation. By encouraging her daughter and helping her learn how to use a knife properly, this mother is fostering the young girl's sense of self-efficacy.

CRITICAL THINKING

Freud Versus Bandura on Human Aggression

Freud viewed aggression as a universal, unconscious human instinct that must be controlled by the internal restraints of the superego and the external restraints of culture, society, and morality. In Freud's eyes, aggressive instincts were part of the irrational, impulsive, and unconscious id. Social cognitive theorists, however, discount the importance of unconscious instincts or motives. Instead, they emphasize that behavior is driven by conscious goals and motives. Not surprisingly, Albert Bandura has taken issue with Freud's explanation of war and cruelty as being caused by the failure of the rational ego, the superego's restraints, and society's laws to control the id's destructive impulses (see the Critical Thinking box, "Freud Versus Rogers on Human Nature"). Bandura (1986) has noted that some of the most horrifying examples of human cruelty have involved conscious, *rational* behavior:

> People frequently engage in destructive activities, not because of reduced self-control, but because their cognitive skills and self-control are too well enlisted through moral justification and self-exonerative devices in the service of destructive causes. The infamous extermination procedures of Nazi concentration camps were perfected in laboratories using human victims. In the Nazi value system, where the enslavement and execution of Jewish people were viewed as meritorious acts of patriotism, camp commandants proudly compared execution rates as if they were industrial production figures. This monstrous death industry required a methodical program of research and efficient and dedicated management. The massive threats to human welfare are generally brought about by deliberate acts of principle, rather than unrestrained acts of impulse.

Given Freud and Bandura's differing views, what do you think?



Rue des Archives/Lebrecht Music & Arts

Unconscious, Irrational Id or Conscious, Rational Choice? Thousands of Nazi soldiers march in perfect formation at a massive rally in Dortmund, Germany, in 1933. Bandura argues that many of the worst horrors of the twentieth century, such as the Nazi extermination camps, were not the result of unrestrained aggressive impulses. Instead, he points out, they reflected deliberate decisions and carefully reasoned choices.

CRITICAL THINKING QUESTIONS

- Are violence, aggression, and cruelty the result of the unleashing of uncontrolled unconscious forces, or of deliberate, conscious decisions?
- Consider a contemporary conflict or atrocity. How would Freud and Bandura explain people's behavior?
- In your opinion, which theorist's explanation seems more accurate?

Bandura's concept of self-efficacy makes it easier to understand why people often fail to perform optimally at certain tasks, even though they possess the necessary skills. Sandy has made presentations in front of hundreds of people, knows how to slab a geode with a diamond saw, can easily navigate Chicago's rush-hour traffic, and once single-handedly landed an eight-pound northern pike. In all these situations, she has strong feelings of self-efficacy. But hand her a package containing a light switch and she's intimidated.

Hence, our self-system is very flexible. How we regard ourselves and our abilities varies depending on the situations or tasks we're facing. In turn, our beliefs influence the tasks we are willing to try and how persistent we'll be in the face of obstacles (Bandura, 1996, 2004b).

With the light switch, Don insisted on proving to Sandy that she was capable of changing it. "Well, maybe if I watched you install one, I might be willing to try it," Sandy finally offered. Sandy's suggestion illustrates how we acquire new behaviors and strengthen our beliefs of self-efficacy in particular situations through observational learning and *mastery experiences* (Bandura, 2001, 2004b). When we perform a task successfully, our sense of self-efficacy becomes stronger. When we fail to deal effectively with a particular task or situation, our sense of self-efficacy is undermined.

> The most effective way of developing a strong sense of efficacy is through mastery experiences. Successes build a robust belief in one's efficacy. Failures undermine it. A second way is through social modeling. If people see others like themselves succeed by sustained effort, they come to believe that they, too, have the capacity to do so. Social persuasion is a third way of strengthening people's beliefs in their efficacy. If people are persuaded that they have what it takes to succeed, they exert more effort than if they harbor self-doubts and dwell on personal deficiencies when problems arise
>
> —*Albert Bandura (2004b)*

From very early in life, children develop feelings of self-efficacy from their experiences in dealing with different tasks and situations, such as athletic, social, and academic activities (Bandura & others, 2003). As Bandura (1992) has pointed out, developing self-efficacy begins in childhood, but it continues as a lifelong process. Each stage of the lifespan presents new challenges. And just for the record, Sandy *did* successfully replace the broken light switch. Now, about that dripping faucet . . .

Evaluating the Social Cognitive Perspective on Personality

A key strength of the social cognitive perspective on personality is its grounding in empirical, laboratory research (Bandura, 2004a). The social cognitive perspective is built on research in learning, cognitive psychology, and social psychology, rather than on clinical impressions. And, unlike vague psychoanalytic and humanistic concepts, the concepts of social cognitive theory are scientifically testable—that is, they can be operationally defined and measured. For example, psychologists can study beliefs of self-efficacy by comparing subjects who are low in self-efficacy in a given situation with subjects who are high in self-efficacy (e.g., Ozer & Bandura, 1990). Not surprisingly, then, the social cognitive perspective has had a major impact on the study of personality.

However, some psychologists feel that the social cognitive approach to personality applies *best* to laboratory research. In the typical laboratory study, the relationships among a limited number of very specific variables are studied. In everyday life, situations are far more complex, with multiple factors converging to affect behavior and personality. Thus, an argument can be made that clinical data, rather than laboratory data, may be more reflective of human personality.

The social cognitive perspective also ignores unconscious influences, emotions, or conflicts. Some psychologists argue that the social cognitive theory focuses on very limited areas of personality—learning, the effects of situations, and the effects of beliefs about the self. Thus, it seems to lack the richness of psychoanalytic and humanistic theories, which strive to explain the *whole* person, including the unconscious, irrational, and emotional aspects of personality (McAdams & Pals, 2006; Westen, 1990).

Nevertheless, by emphasizing the reciprocal interaction of mental, behavioral, and situational factors, the social cognitive perspective recognizes the complex combination of factors that influence our everyday behavior. By emphasizing the important role of learning, especially observational learning, the social cognitive perspective offers a developmental explanation of human functioning that persists throughout one's lifetime. Finally, by emphasizing the self-regulation of behavior, the social cognitive perspective places most of the responsibility for our behavior—and for the consequences we experience—squarely on our own shoulders.

CONCEPT REVIEW 11.3

The Humanistic and Social Cognitive Perspectives

Determine whether each of the following statements is true or false. If a statement is false, rewrite it to correct it.

_____ 1. According to Carl Rogers, children's impulses are innately good, and they should never be disciplined.

_____ 2. Carl Rogers strongly advocated the use of conditional positive regard to enhance the psychological well-being of others.

_____ 3. Unlike Freud, Rogers believed that people should be given greater freedom to choose the values and experiences that are important to them.

_____ 4. The humanistic perspective on personality has been criticized for being too optimistic about human nature.

_____ 5. According to social cognitive theory, people's behavior is determined solely by environmental influences.

_____ 6. Self-efficacy beliefs can vary from one situation to another.

_____ 7. Rather than clinical impressions, the social cognitive perspective is supported by research in learning, cognitive psychology, and social psychology.

The Trait Perspective on Personality

KEY THEME

› Trait theories of personality focus on identifying, describing, and measuring individual differences.

KEY QUESTIONS

› What are traits, and how do surface and source traits differ?

› What are three influential trait theories, and how might heredity affect personality?

› What are the key strengths and weaknesses of trait theories of personality?

Suppose we asked you to describe the personality of a close friend. How would you begin? Would you describe her personality in terms of her unconscious conflicts, the congruence of her self-concept, or her level of self-efficacy? Probably not. Instead, you'd probably generate a list of her personal characteristics, such as "outgoing," "cheerful," and "generous." This rather commonsense approach to personality is shared by the trait theories.



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"Oh, God! Here comes little Miss perky."

The trait approach to personality is very different from the theories we have encountered thus far. The psychoanalytic, humanistic, and social cognitive theories emphasize the *similarities* among people. They focus on discovering the universal processes of motivation and development that explain human personality (Revelle, 1995, 2007). Although these theories do deal with individual differences, they do so only indirectly. In contrast, the trait approach to personality *focuses primarily on describing individual differences* (Funder & Fast, 2010).

Trait theorists view the person as being a unique combination of personality characteristics or attributes, called *traits*. A **trait** is formally defined as a relatively stable, enduring predisposition to behave in a certain way. A **trait theory** of personality, then, is one that focuses on identifying, describing, and measuring individual differences in behavioral predispositions. Think back to our description of the twins, Kenneth and Julian, in the chapter Prologue. You can probably readily identify some of their personality traits. For example, Julian was described as impulsive, cocky, and adventurous, while Kenneth was serious, intense, and responsible.

People possess traits to different degrees. For example, a person might be extremely shy, somewhat shy, or not shy at all. Hence, a trait is typically described in terms of a range from one extreme to its opposite. Most people fall in the middle of the range (average shyness), while fewer people fall at opposite poles (extremely shy or extremely outgoing).

Surface Traits and Source Traits

Most of the terms that we use to describe people are **surface traits**—traits that lie on "the surface" and can be easily inferred from observable behaviors. Examples of surface traits include attributes like "happy," "exuberant," "spacey," and "gloomy." The list of potential surface traits is extremely long. Personality researcher Gordon Allport combed through an English-language dictionary and discovered more than 4,000 words that described specific personality traits (Allport & Odbert, 1936).

Source traits are thought to be more fundamental than surface traits. As the most basic dimension of personality, a source trait can potentially give rise to a vast number of surface traits. Trait theorists believe that there are relatively few source traits. Thus, one goal of trait theorists has been to identify the most basic set of universal source traits that can be used to describe all individual differences (Pervin, 1994).

- **trait** A relatively stable, enduring predisposition to consistently behave in a certain way.
- **trait theory** A theory of personality that focuses on identifying, describing, and measuring individual differences in behavioral predispositions.
- **surface traits** Personality characteristics or attributes that can easily be inferred from observable behavior.
- **source traits** The most fundamental dimensions of personality; the broad, basic traits that are hypothesized to be universal and relatively few in number.

TABLE 11.3

Cattell's 16 Personality Factors

1 Reserved, unsociable	⟷	Outgoing, sociable
2 Less intelligent, concrete	⟷	More intelligent, abstract
3 Affected by feelings	⟷	Emotionally stable
4 Submissive, humble	⟷	Dominant, assertive
5 Serious	⟷	Happy-go-lucky
6 Expedient	⟷	Conscientious
7 Timid	⟷	Venturesome
8 Tough-minded	⟷	Sensitive
9 Trusting	⟷	Suspicious
10 Practical	⟷	Imaginative
11 Forthright	⟷	Shrewd, calculating
12 Self-assured	⟷	Apprehensive
13 Conservative	⟷	Experimenting
14 Group-dependent	⟷	Self-sufficient
15 Undisciplined	⟷	Controlled
16 Relaxed	⟷	Tense

Source: Adapted from Cattell (1973).

Raymond Cattell believed that personality could be described in terms of 16 source traits, or basic personality factors. Each factor represents a dimension that ranges between two extremes.

Two Representative Trait Theories

Raymond Cattell and Hans Eysenck

How many source traits are there? Not surprisingly, trait theorists differ in their answers. Pioneer trait theorist **Raymond Cattell** reduced Allport's list of 4,000 terms to about 171 characteristics by eliminating terms that seemed to be redundant or uncommon (see John, 1990). Cattell collected data on a large sample of people, who were rated on each of the 171 terms. He then used a statistical technique called *factor analysis* to identify the traits that were most closely related to one another. After further research, Cattell eventually reduced his list to 16 key personality factors, which are listed in Table 11.3.

Cattell (1994) believed that these 16 personality factors represent the essential source traits of human personality. To measure these traits, Cattell developed what has become one of the most widely used personality tests, the *Sixteen Personality Factor Questionnaire* (abbreviated *16PF*). We'll discuss the 16PF in more detail later in the chapter.

An even simpler model of universal source traits was proposed by British psychologist **Hans Eysenck** (1916–1997). Eysenck's methods were similar to Cattell's, but his conception of personality includes just three dimensions. The first dimension is *introversion–extraversion*, which is the degree to which a person directs her energies outward toward the environment and other people versus inward toward her inner and self-focused experiences. A person who is high on the dimension of *introversion* might be quiet, solitary, and reserved, avoiding new experiences. A person high on the *extraversion* scale would be outgoing and sociable, enjoying new experiences and stimulating environments.



Raymond Cattell (1905–1998) Cattell was a strong advocate of the trait approach to personality. His research led to the development of the Sixteen Personality Factor Questionnaire, one of the most widely used psychological tests for assessing personality.

Courtesy of Mary Cattell

Eysenck's second major dimension is *neuroticism–emotional stability*. *Neuroticism* refers to a person's predisposition to become emotionally upset, while *stability* reflects a person's predisposition to be emotionally even. Surface traits associated with neuroticism are anxiety, tension, depression, and guilt. At the opposite end, emotional stability is associated with the surface traits of being calm, relaxed, and even-tempered.

Eysenck believed that by combining these two dimensions people can be classified into four basic types: introverted–neurotic, introverted–stable, extraverted–neurotic, and extraverted–stable. Each basic type is associated with a different combination of surface traits, as shown in Figure 11.3.

In later research, Eysenck identified a third personality dimension, called *psychoticism* (Eysenck, 1990; Eysenck & Eysenck, 1975). A person high on this trait is antisocial, cold, hostile, and unconcerned about others. A person who is low on psychoticism is warm and caring toward others. In the chapter Prologue, Julian might be described as above average on psychoticism, while Kenneth was extremely low on this trait.

Eysenck (1990) believed that individual differences in personality are due to biological differences among people. For example, Eysenck proposed that an introvert's nervous system is more easily aroused than is an extravert's nervous system. Assuming that people tend to seek out an optimal level of arousal (see Chapter 8), extraverts would seek stimulation from their environment more than introverts would. And, because introverts would be more uncomfortable than extraverts in a highly stimulating environment, introverts would be much less likely to seek out stimulation.

Do introverts and extraverts actually prefer different environments? In a clever study, John Campbell and Charles Hawley (1982) found that extraverted students tended to study in a relatively noisy, open area of a college library, where there were ample opportunities for socializing with other students. Introverted students

■ **five-factor model of personality** A trait theory of personality that identifies extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience as the fundamental building blocks of personality.



FIGURE 11.3 Eysenck's Theory of Personality Types Hans Eysenck's representation of the four basic personality types. Each type represents a combination of two basic personality dimensions: extraversion–introversion and neuroticism–emotional stability. Note the different surface traits in each quadrant that are associated with each basic personality type.

Source: Adapted from Eysenck (1982).

preferred to study in a quiet section of the library, where individual carrels and small tables were separated by tall bookshelves. As Eysenck's theory predicts, the introverts preferred study areas that minimized stimulation, while the extraverts preferred studying in an area that provided stimulation.

Sixteen Are Too Many, Three Are Too Few

The Five-Factor Model

Many trait theorists felt that Cattell's trait model was too complex and that his 16 personality factors could be reduced to a smaller, more basic set of traits. Yet Eysenck's three-dimensional trait theory seemed too limited, failing to capture other important dimensions of human personality (see Block, 1995).

Today, the consensus among many trait researchers is that the essential building blocks of personality can be described in terms of five basic personality dimensions, which are sometimes called "the Big Five" (Funder, 2001). According to the **five-factor model of personality,** these five dimensions represent the structural organization of personality traits (McCrae & Costa, 1996, 2003).

What are the Big Five? Different trait researchers describe the five basic traits somewhat differently. However, the most commonly accepted five factors are extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience. Table 11.4 summarizes the Big Five traits, as defined by personality theorists Robert McCrae and Paul Costa, Jr. Note that factor 1, neuroticism, and factor 2, extraversion, are essentially the same as Eysenck's first two personality dimensions.

Does the five-factor model describe the universal structure of human personality? According to ongoing research by Robert McCrae and his colleagues (2004, 2005), the answer appears to be yes. In one wide-ranging study, trained observers rated the personality traits of representative individuals in 50 different cultures, including Arab cultures like those in Kuwait and Morocco, and African cultures like those in Uganda and Ethiopia (McCrae & others, 2005). With few exceptions, people could be reliably described in terms of the five-factor structure of personality. Other research has shown that people in European, African, Arab, and Asian cultures describe personality using

TABLE 11.4

The Five-Factor Model of Personality

Low ⟷ High	
Factor 1: Neuroticism	
Calm	Worrying
Even-tempered, unemotional	Temperamental, emotional
Hardy	Affectionate
Factor 2: Extraversion	
Reserved	Affectionate
Loner	Joiner
Quiet	Talkative
Factor 3: Openness to Experience	
Down-to-earth	Imaginative
Conventional, uncreative	Original, creative
Prefer routine	Prefer variety
Factor 4: Agreeableness	
Antagonistic	Acquiescent
Ruthless	Softhearted
Suspicious	Trusting
Factor 5: Conscientiousness	
Lazy	Hardworking
Aimless	Ambitious
Quitting	Persevering

Source: Adapted from McCrae & Costa (1990).

This table shows the five major personality factors, according to Big Five theorists Robert McCrae and Paul Costa, Jr. Listed below each major personality factor are surface traits that are associated with it. Note that each factor represents a dimension or range between two extreme poles. Most people will fall somewhere in the middle between the two opposing poles.

behavioral genetics An interdisciplinary field that studies the effects of genes and heredity on behavior.

terms that are consistent with the five-factor model (Allik & McCrae, 2004; Rossier & others, 2005). Based on abundant cross-cultural research, trait theorists Jüri Allik and Robert McCrae (2002, 2004) now believe that the Big Five personality traits are basic features of the human species, universal, and probably biologically based.

How can we account for the apparent universality of the five-factor structure? Psychologist David Buss (1991, 1995a) has one intriguing explanation. Buss thinks we should look at the utility of these factors from an evolutionary perspective. He believes that the Big Five traits reflect the personality dimensions that are the most important in the "social landscape" to which humans have had to adapt. Being able to identify who has social power (extraversion), who is likely to share resources (agreeableness), and who is trustworthy (conscientiousness) enhances our likelihood of survival.

Research has shown that traits are remarkably stable over time. A young adult who is very extraverted, emotionally stable, and relatively open to new experiences is likely to grow into an older adult who could be described in much the same way (McCrae & Costa, 1990, 2003, 2006; McCrae & others, 2000). However, this is not to say that personality traits don't change at all. Longitudinal data suggest that some general trends are evident over the lifespan. These include a slight decline in neuroticism, an increase in agreeableness and conscientiousness, and stability in extraversion and openness to experience from early to late adulthood (Soto & others, 2011). In other words, most people become more dominant, agreeable, conscientious, and emotionally stable as they mature psychologically (Caspi & others, 2005; Roberts & others, 2006).

Traits are also generally consistent across different situations. However, situational influences may affect the expression of personality traits. Situations in which your behavior is limited by social "rules" or expectations may limit the expression of your personality characteristics. For example, even the most extraverted person may be subdued at a funeral. In general, behavior is most likely to reflect personality traits in familiar, informal, or private situations with few social rules or expectations (A. H. Buss, 1989, 2001).

Given the consistency of traits over time and across situations, many psychologists think that traits may be associated with specific patterns of brain activity or structure (Canli, 2004, 2006). We discuss a recent attempt to investigate the relationship between brain structure and personality traits in the Focus on Neuroscience box, "The Neuroscience of Personality: Brain Structure and the Big Five."

Keep in mind, however, that human behavior is the result of a complex *interaction* between traits and situations (Mischel, 2004; Mischel & Shoda, 2010). People *do* respond, sometimes dramatically, to the demands of a particular situation. But the situations that people choose, and the characteristic way in which they respond to similar situations, are likely to be consistent with their individual personality dispositions (Mischel & Shoda, 1995; Mischel & others, 2002).



Courtesy of Don Hockenbury

The Continuity of Traits Over the Lifespan Kenneth's conscientiousness was a trait that was evident throughout his life. Because he was too old to join the military when the United States entered World War II, Kenneth volunteered his legal expertise to the American Red Cross, providing them with legal services for the western half of the United States.

Personality Traits and Behavioral Genetics

Just a Chip Off the Old Block?

Do personality traits run in families? Are personality traits determined by genetics? Many trait theorists, such as Raymond Cattell and Hans Eysenck, believed that traits are at least partially genetic in origin. For example, our daughter, Laura, has always been outgoing and sociable, traits that she shares with both her parents. But is she outgoing because she inherited that trait from us? Or is she outgoing because we modeled and reinforced outgoing behavior? Is it even possible to sort out the relative influence that genetics and environmental experiences have on personality traits?

The field of **behavioral genetics** studies the effects of genes and heredity on behavior. Most behavioral genetics studies on humans involve measuring similarities and differences among members of a large group of people who are genetically related to different degrees. The basic research strategy is to compare the degree of difference among subjects to their degree of genetic relatedness. If a trait is genetically influenced, then the more closely two people are genetically related, the more you would expect them to be similar on that trait (see Chapter 7).

Behavioral genetics has documented, without a shadow of a remaining doubt, that personality is to some degree genetically influenced: Identical twins reared apart have similar traits. The *tabula rasa* view of personality as a blank slate at birth that is written upon by experience, for many years a basic assumption of theories of all stripes, is wrong.

—David C. Funder (2001)

FOCUS ON NEUROSCIENCE

The Neuroscience of Personality: Brain Structure and the Big Five

Many personality theorists, like Hans Eysenck, believed that personality traits are associated with characteristic biological differences among people (DeYoung & Gray, 2009). Some studies have confirmed this belief, identifying distinct patterns of brain activity associated with different personality traits (Canli, 2004, 2006). For example, brain-imaging studies showed that people who were high in extraversion (Factor 2) showed higher levels of brain activation in response to positive images than people who were low in extraversion. Similarly, people who score high on Factor 1, neuroticism, show more activation in response to negative images than people who score low on neuroticism (Canli & others, 2001).

Are personality traits also associated with brain structure? Psychologist Colin DeYoung and his colleagues had over 100 male and female participants undergo MRI scans and also take the *NEO-Personality Inventory*, a personality test that is used to measure the Big Five. The researchers then compared the brain scans and the personality test results. They found:

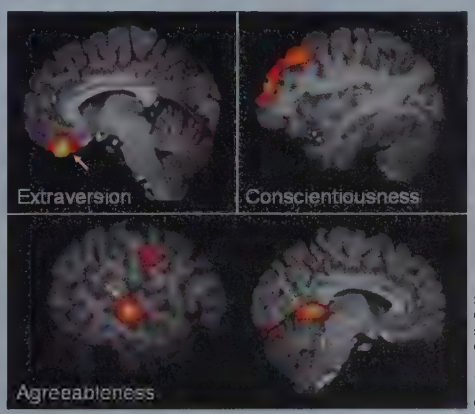
- *Extraversion* was associated with larger brain tissue volume in the *medial orbitofrontal cortex*, a brain region that is associated with sensitivity to rewarding stimuli.
- *Agreeableness* was associated with increased volume in the *posterior cingulate cortex*, a brain region associated with understanding the beliefs of others (Saxe & Powell, 2006). It was also associated with greater volume in the *fusiform gyrus*, an area of the cortex specialized for perceiving faces (see Chapters 3 and 7).
- *Conscientiousness* was associated with a large region of the frontal cortex called the *middle frontal gyrus*, which is known to be involved in planning, working memory, and self-regulation.

But not all personality traits had such clear correlations. *Neuroticism* was associated with a mixed pattern of brain structure differences. Higher levels of neuroticism were associated with *reduced* volume in one area of the hippocampus, a finding that has also been found in stress and depression (Bremner & others, 2000). Another region, the mid-cingulate cortex, which is believed to be associated with pain sensitivity, was larger. Taken together, the pattern of differences led the researchers to conclude that neuroticism is related to structural differences in brain systems related to sensitivity to threat and punishment.

Finally, DeYoung and his colleagues found no significant pattern of brain differences associated with openness to experience (Factor 5). They observed a slightly greater brain volume in one region that is associated with working memory and attention, but the difference was not statistically significant.

Are such studies merely phrenology with a modern face? These findings, while still preliminary, do suggest that there are biological influences on personality. It's important to note, though, that the findings are *correlational*. It's entirely possible that the brain differences are caused by different patterns of behavior rather than the other way around.

Further, unlike the phrenologists (see Chapter 2), today's researchers are well aware that both brain differences and personality traits are shaped by the complex interaction of environmental, genetic, and biological influences. As DeYoung (2010b) says, the ultimate goal is to use the methods of neuroscience to help generate a new theory of personality—one in which personality is seen as a "system of dynamic, interacting elements that generates the ongoing flux of behavior and experience."



Personality Traits and the Brain Red and yellow highlight regions where brain volume was significantly associated with specific personality traits. The lighter the color, the stronger the association (DeYoung & others, 2010).

Such studies may involve comparisons between identical twins and fraternal twins or comparisons between twins reared apart and identical twins reared together (see the In Focus box, "Explaining Those Amazing Identical-Twin Similarities" on the next page). Adoption studies, in which adopted children are compared to their biological and adoptive relatives, are also used in behavioral genetics.

Evidence gathered from twin studies and adoption studies shows that certain personality traits *are* substantially influenced by genetics (Amin & others, 2011; de Moor & others, 2010; McCrae & others, 2010). The evidence for genetic influence is particularly strong for extraversion and neuroticism, two of the Big Five personality traits (Plomin & others, 1994, 2001; Weiss & others, 2008). Twin studies have also found that openness to experience, conscientiousness, and agreeableness are also influenced by genetics, although to a lesser extent (Bouchard, 2004; Harris & others, 2007).

Genes confer dispositions, not destinies.

—Danielle Dick & Richard Rose (2002)

IN FOCUS

Explaining Those Amazing Identical-Twin Similarities

As part of the ongoing *Minnesota Study of Twins Reared Apart* at the University of Minnesota, researchers David Lykken, Thomas Bouchard, and other psychologists have been studying a very unusual group of people: over 100 pairs of identical and fraternal twins who were separated at birth or in early childhood and raised in different homes. Shortly after the study began in 1980, the researchers were struck by some of the amazing similarities between identical twins (Lykken & others, 1992). Despite having been separated for most of their lives, many twins had similar personality traits, occupations, hobbies, and habits.

One of the most famous cases is that of the "Jim twins," who had been separated for close to 40 years. Like many of the other reunited twins, the two Jims had similar heights, postures, and voice and speech patterns. More strikingly, both Jims had married and divorced women named Linda, and then married women named Betty. One Jim named his son James Allan, while the other Jim named his son James Alan. Both Jims bit their nails, chain-smoked Salems, and enjoyed working in their basement workshops. And both Jims had vacationed at the same Florida beach, driving there in the same model Chevrolet (Lykken & others, 1992).

Granted, such similarities could simply be due to coincidence. Linda, Betty, James, and Alan are not exactly rare names in the United States. And literally thousands of people buy the same model car every year, just as thousands of people vacation in Florida. Besides, if you look closely at any two people of the same age, sex, and culture, there are bound to be similarities. It's probably a safe bet, for example, to say that most college students enjoy eating pizza and often wear jeans and T-shirts.



© Lisa Kohler

Heredity or Environment? Along with sharing common genes, many identical twins share common interests and talents—like concert pianists Alvin *(left)* and Alan Chow. As students at the University of Maryland, they graduated with identical straight-A averages—and shared the stage as co-valedictorians. Both studied piano at Juilliard, and today they are both music professors with active performance schedules. In addition to performing solo, they frequently perform together in recital. However, the Chow twins were reared together, so it would be difficult to determine the relative importance of environmental and genetic influences on their talents and career paths.

But it's difficult to dismiss as mere coincidences all the striking similarities between identical twins in the Minnesota study. Lykken and his colleagues (1992) have pointed out numerous quirky similarities that occurred in the identical twins they studied but did not occur in the fraternal-twin pairs. For example, in the entire sample of twins, there were only two subjects who had been married five times; two subjects who habitually wore seven rings; and two who left love notes around the house for their wives. In each case, the two were identical twins. And only two subjects independently (and correctly) diagnosed a problem with researcher Bouchard's car—a faulty wheel bearing. Again, the two were members of an identical-twin pair. While Lykken and his colleagues acknowledge that some identical-twin similarities are probably due to coincidence, such as the Jim twins marrying women with the same first names, others are probably genetically influenced.

So does this mean that there's a gene for getting married five times or wearing seven rings? Not exactly. Although some physical characteristics and diseases are influenced by a single gene, complex psychological characteristics, such as your personality, are influenced by a large number of genes acting in combination (Caspi & others, 2005; Marcus, 2004). Unlike fraternal twins and regular siblings, identical twins share the same specific *configuration* of interacting genes. Lykken and his colleagues suggest that many complex psychological traits, including the strikingly similar idiosyncrasies of identical twins, may result from a unique configuration of interacting genes.

Lykken and his colleagues call certain traits *emergenic traits* because they appear (or *emerge*) only out of a unique configuration of many interacting genes. Although they are genetically influenced, emergenic traits do not run in families. To illustrate the idea of emergenic traits, consider the couple of average intelligence who give birth to an extraordinarily gifted child. By all predictions, this couple's offspring should have normal, average intelligence. But because of the unique configuration of the child's genes acting in combination, extraordinary giftedness emerges (Lykken, 2006; Lykken & others, 1992).

David Lykken compares emergenic traits to a winning poker hand. All the members of the family are drawing from the same "deck," or pool of genes. But one member may come up with the special configuration of cards that produces a royal flush—the unique combination of genes that produces a Shakespeare, an Einstein, or a Beethoven. History is filled with cases of people with exceptional talents and abilities in varied fields who grew up in average families.

Finally, it's important to point out that there were many differences, as well as similarities, between the identical twins in the Minnesota study. For example, one twin was prone to depression, while the other was not; one twin was an alcoholic, while the other did not drink. So, even with identical twins, it must be remembered that personality is only *partly* determined by genetics.

So is personality completely determined by genetics? Not at all. As behavioral geneticists Robert Plomin and Essi Colledge (2001) explain, "Individual differences in complex psychological traits are due at least as much to environmental influences as they are to genetic influences. Behavioral genetics research provides the best available evidence for the importance of the environment." In other words, the influence of environmental factors on personality traits is at least equal to the influence of genetic factors (Rowe, 2003). Some additional evidence that underscores this point is that identical twins are most alike in early life. As the twins grow up, leave home, and encounter different experiences and environments, their personalities become more different (Bouchard, 2004; McCartney & others, 1990).



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Why Are Siblings So Different?
Although two children may grow up in the same home, they experience the home environment in very different ways. Even an event that affects the entire family, such as divorce, unemployment, or a family move, may be experienced quite differently by each child in the family. Children are also influenced by varied experiences outside the home, such as their relationships with teachers, classmates, and friends. Illness and accidents are other non-shared environmental influences. Of course, sibling relationships are themselves a potential source of influence on personality development.

Evaluating the Trait Perspective on Personality

Although psychologists continue to disagree on how many basic traits exist, they do generally agree that people can be described and compared in terms of basic personality traits. But like the other personality theories, the trait approach has its weaknesses (Block, 1995).

One criticism is that trait theories don't really explain human personality (Pervin, 1994; Epstein, 2010). Instead, they simply label general predispositions to behave in a certain way. Second, trait theorists don't attempt to explain how or why individual differences develop (Boyle, 2008). After all, saying that trait differences are due partly to genetics and partly to environmental influences isn't saying much.

A third criticism is that trait approaches generally fail to address other important personality issues, such as the basic motives that drive human personality, the role of unconscious mental processes, how beliefs about the self influence personality, or how psychological change and growth occur (Block, 2010; McAdams & Walden, 2010). Conspicuously absent are the grand conclusions about the essence of human nature that characterize the psychoanalytic and humanistic theories. So, although trait theories are useful in describing individual differences and predicting behavior, there are limitations to their usefulness.

As you've seen, each of the major perspectives on personality has contributed to our understanding of human personality. The four perspectives are summarized in Table 11.5.

TABLE 11.5

The Major Personality Perspectives

Perspective	Key Theorists	Key Themes and Ideas
Psychoanalytic	Sigmund Freud	Influence of unconscious psychological processes; importance of sexual and aggressive instincts; lasting effects of early childhood experiences
	Carl Jung	The collective unconscious, archetypes, and psychological wholeness
	Karen Horney	Importance of parent–child relationship; defending against basic anxiety; womb envy
	Alfred Adler	Striving for superiority, compensating for feelings of inferiority
Humanistic	Carl Rogers	Emphasis on the self-concept, psychological growth, free will, and inherent goodness
	Abraham Maslow	Behavior as motivated by hierarchy of needs and striving for self-actualization
Social Cognitive	Albert Bandura	Reciprocal interaction of behavioral, cognitive, and environmental factors; emphasis on conscious thoughts, self-efficacy beliefs, self-regulation, and goal setting
Trait	Raymond Cattell	Emphasis on measuring and describing individual differences; 16 source traits of personality
	Hans Eysenck	Three basic dimensions of personality: introversion–extraversion, neuroticism–emotional stability, and psychoticism
	Robert McCrae, Paul Costa, Jr.	Five-factor model, five basic dimensions of personality: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness

psychological test A test that assesses a person's abilities, aptitudes, interests, or personality on the basis of a systematically obtained sample of behavior.

projective test A type of personality test that involves a person's interpreting an ambiguous image; used to assess unconscious motives, conflicts, psychological defenses, and personality traits.

Rorschach Inkblot Test A projective test using inkblots, developed by Swiss psychiatrist Hermann Rorschach in 1921.

graphology A pseudoscience that claims to assess personality, social, and occupational attributes based on a person's distinctive handwriting, doodles, and drawing style.

Our discussion of personality would not be complete without a description of how personality is formally evaluated and measured. In the next section, we'll briefly survey the tests that are used in personality assessment.

Assessing Personality

Psychological Tests

KEY THEME

› Tests to measure and evaluate personality fall into two basic categories: projective tests and self-report inventories.

KEY QUESTIONS

› What are the most widely used personality tests, and how are they administered and interpreted?

› What are some key strengths and weaknesses of projective tests and self-report inventories?

When we discussed intelligence tests in Chapter 7, we described what makes a good psychological test. Beyond intelligence tests, there are literally hundreds of **psychological tests** that can be used to assess abilities, aptitudes, interests, and personality (Spies & others, 2010). Any psychological test is useful insofar as it achieves two basic goals:

1. It accurately and consistently reflects a person's characteristics on some dimension.
2. It predicts a person's future psychological functioning or behavior.

In this section, we'll look at the very different approaches used in the two basic types of personality tests—projective tests and self-report inventories. After looking at some of the most commonly used tests in each category, we'll evaluate the strengths and weaknesses of each approach.

What Do You See in the Inkblot?

Intrigued by Freud's and Jung's theories, Swiss psychiatrist Hermann Rorschach (1884–1922) set out to develop a test that would reveal the contents of the unconscious. Rorschach believed that people were more likely to expose their unconscious conflicts, motives, and defenses in their descriptions of the ambiguous inkblots than they would be if the same topics were directly addressed. Rorschach published a series of 10 ink blots with an accompanying manual in a monograph titled *Psychodiagnostics: A Diagnostic Test Based on Perception* in 1921. Because he died the following year, Rorschach never knew how popular his projective test would become. Although the validity of the test is questionable, the Rorschach Inkblot Test is still the icon most synonymous with psychological testing in the popular media.

Projective Tests

Like Seeing Things in the Clouds

Projective tests developed out of psychoanalytic approaches to personality. In the most commonly used projective tests, a person is presented with a vague image, such as an inkblot or an ambiguous scene, then asked to describe what she "sees" in the image. The person's response is thought to be a projection of her unconscious conflicts, motives, psychological defenses, and personality traits. Notice that this idea is related to the defense mechanism of *projection,* which was described in Table 11.1 earlier in the chapter. The first projective test was the famous **Rorschach Inkblot Test,** published by Swiss psychiatrist Hermann Rorschach in 1921 (Hertz, 1992).





Spencer Grant/Photo Edit; The Granger Collection, New York

The Rorschach test consists of 10 cards, 5 that show black-and-white inkblots and 5 that depict colored inkblots. One card at a time, the person describes whatever he sees in the inkblot. The examiner records the person's responses verbatim and also observes his behavior, gestures, and reactions.

Numerous scoring systems exist for the Rorschach. Interpretation is based on such criteria as whether the person reports seeing animate or inanimate objects, human or animal figures, and movement, and whether the person deals with the whole blot or just fragments of it (Exner & Erdberg, 2005; Exner, 2007).

SCIENCE VERSUS PSEUDOSCIENCE

Graphology: The "Write" Way to Assess Personality?

Does the way that you shape your *d*'s, dot your *i*'s, and cross your *t*'s reveal your true inner nature? That's the basic premise of **graphology**, a pseudoscience that claims that your handwriting reveals your temperament, personality traits, intelligence, and reasoning ability. If that weren't enough, graphologists also claim that they can accurately evaluate a job applicant's honesty, reliability, leadership potential, ability to work with others, and so forth (Beyerstein, 2007; Beyerstein & Beyerstein, 1992).

Handwriting analysis is very popular throughout North America and Europe. In the United States alone, there are over 30 graphology societies, each promoting its own specific methods of analyzing handwriting (Beyerstein, 1996). Many different types of agencies and institutions use graphology. For example, the FBI and the U.S. State Department have consulted graphologists to assess the handwriting of people who mail death threats to government officials (Scanlon & Mauro, 1992).

Graphology is especially popular in the business world. Thousands of American companies, including Sears, U.S. Steel, and Bendix, have used graphology to assist in hiring new employees (Basil, 1991; Taylor & Sackheim, 1988). The use of graphology in hiring and promotions is even more widespread in Europe. According to one estimate, over 80 percent of European companies use graphology in personnel matters (Greasley, 2000; see Simner & Goffin, 2003).

When subjected to scientific evaluation, how does graphology fare? Consider a study by Anthony Edwards and Peter Armitage (1992) that investigated graphologists' ability to distinguish among people in three different groups:

- Successful versus unsuccessful secretaries
- Successful business entrepreneurs versus librarians and bank clerks
- Actors and actresses versus monks and nuns

In designing their study, Edwards and Armitage enlisted the help of leading graphologists and incorporated their suggestions into the study design. The graphologists preapproved the study's format and indicated that they felt it was a fair test of graphology. The graphologists also predicted they would have a high degree of success in discriminating among the people in each group. One graphologist stated that the graphologists would have close to a 100 percent success rate. Remember that prediction.

The three groups—successful/unsuccessful secretaries, entrepreneurs/librarians, and actors/monks—represented a combined total of 170 participants. As requested by the graphologists, all participants indicated their age, sex, and hand preference. Each person also produced 20 lines of sponfaneous handwriting on a neutral topic.

Four leading graphologists independently evaluated the handwriting samples. For each group, the graphologists tried to assign each handwriting sample to one category or the other. Two control measures were built into the study: (1) The handwriting samples were also analyzed by four ordinary people with *no* formal training in graphology or psychology; and (2) a *typewritten* transcript of the handwriting samples was evaluated by four psychologists. The psychologists made their evaluations on the basis of the *content* of the transcripts rather than on the handwriting itself.

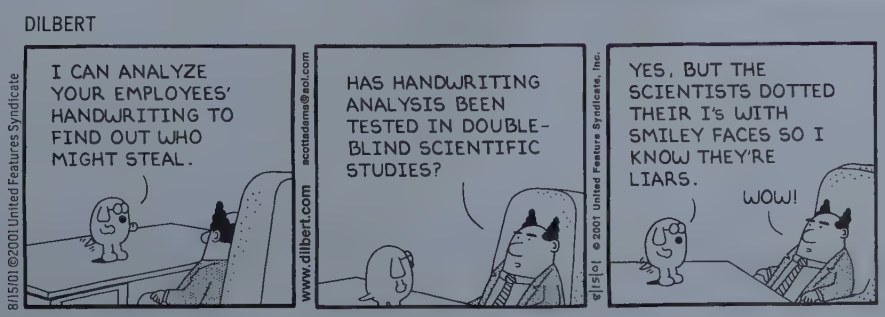
In the accompanying table, you can see how well the graphologists fared as compared to the untrained evaluators and the psychologists. Clearly, the graphologists fell far short of the nearly perfect accuracy they predicted they would demonstrate. In fact, in one case, the *untrained* assessors actually *outperformed* the graphologists—they were slightly better at identifying successful versus unsuccessful secretaries.

Overall, the completely inexperienced judges achieved a success rate of 59 percent correct. The professional graphologists achieved a slightly better success rate of 65 percent. Obviously, this is not a great difference.

Hundreds of other studies have cast similar doubts on the ability of graphology to identify personality characteristics and to predict job performance from handwriting samples (Bangerter & others, 2009; Dazzi & Pedrabissi, 2009). In a global review of the evidence, psychologist Barry Beyerstein (1996) wrote, "Graphologists have unequivocally failed to demonstrate the validity or reliability of their art for predicting work performance, aptitudes, or personality. . . . If graphology cannot legitimately claim to be a scientific means of measuring human talents and leanings, what is it really? In short, it is a pseudoscience."

Success Rates by Type of Assessor

Group Assessed	Graphologists	Untrained Assessors	Psychologists
Good/bad secretaries	67%	70%	56%
Entrepreneurs/ librarians	63%	53%	52%
Actors/monks	67%	58%	53%
Overall success rate	65%	59%	54%





Lewis J. Merrim/Photo Researchers, Inc.

The Thematic Apperception Test Developed by psychologists Christiana Morgan and Henry Murray (1935), the TAT involves creating a story about an ambiguous scene, like the one shown on the card this young man is holding. The person is thought to project his own motives, conflicts, and other personality characteristics into the story he creates. According to Murray (1943), "Before he knows it, he has said things about an invented character that apply to himself, things which he would have been reluctant to confess in response to a direct question."

A more structured projective test is the **Thematic Apperception Test,** abbreviated **TAT,** which we discussed in Chapter 8. In the TAT, the person looks at a series of cards, each depicting an ambiguous scene. The person is asked to create a story about the scene, including what the characters are feeling and how the story turns out. The stories are scored for the motives, needs, anxieties, and conflicts of the main character and for how conflicts are resolved (Bellak, 1993; Langan-Fox & Grant, 2006; Moretti & Rossini, 2004). As with the Rorschach, interpreting the TAT involves the subjective judgment of the examiner.

Strengths and Limitations of Projective Tests

Although sometimes used in research, projective tests are mainly used in counseling and psychotherapy. According to many clinicians, the primary strength of projective tests is that they provide a wealth of qualitative information about an individual's psychological functioning, information that can be explored further in psychotherapy.

However, there are several drawbacks to projective tests. First, the testing situation or the examiner's behavior can influence a person's responses. Second, the scoring of projective tests is highly subjective, requiring the examiner to make numerous judgments about the person's responses. Consequently, two examiners may test the same individual and arrive at different conclusions. Third, projective tests often fail to produce consistent results. If the same person takes a projective test on two separate occasions, very different results may be found. Finally, projective tests are poor at predicting future behavior.

The bottom line? Despite their widespread use, hundreds of studies of projective tests seriously question their *validity*—that the tests measure what they purport to measure—and their *reliability*—the consistency of test results (Garb & others, 2004; Weiner & Meyer, 2009). Nonetheless, projective tests remain very popular, especially among clinical psychologists (Butcher & Rouse, 1996; Leichtman, 2004).

Thematic Apperception Test (TAT) A projective personality test that involves creating stories about each of a series of ambiguous scenes.

self-report inventory A type of psychological test in which a person's responses to standardized questions are compared to established norms.

Minnesota Multiphasic Personality Inventory (MMPI) A self-report inventory that assesses personality characteristics and psychological disorders; used to assess both normal and disturbed populations.

California Psychological Inventory (CPI) A self-report inventory that assesses personality characteristics in normal populations.

Sixteen Personality Factor Questionnaire (16PF) A self-report inventory developed by Raymond Cattell that generates a personality profile with ratings on 16 trait dimensions.

Self-Report Inventories

Does Anyone Have an Eraser?

Self-report inventories typically use a paper-and-pencil format and take a direct, structured approach to assessing personality. People answer specific questions or rate themselves on various dimensions of behavior or psychological functioning. Often called *objective personality tests,* self-report inventories contain items that have been shown by previous research to differentiate among people on a particular personality characteristic. Unlike projective tests, self-report inventories are objectively scored by comparing a person's answers to standardized norms collected on large groups of people.

The most widely used self-report inventory is the **Minnesota Multiphasic Personality Inventory (MMPI)** (Butcher, 2010). First published in the 1940s and revised in the 1980s, the current version is referred to as the *MMPI-2.* The MMPI consists of over 500 statements. The person responds to each statement with "True," "False," or

"Cannot say." Topics include social, political, religious, and sexual attitudes; physical and psychological health; interpersonal relationships; and abnormal thoughts and behaviors (Delman & others, 2008; Graham, 1993; McDermut & Zimmerman, 2008). Items similar to those used in the MMPI are shown in Table 11.6.

The MMPI is widely used by clinical psychologists and psychiatrists to assess patients. It is also used to evaluate the mental health of candidates for such occupations as police officers, doctors, nurses, and professional pilots. What keeps people from simply answering items in a way that makes them look psychologically healthy? Like many other self-report inventories, the MMPI has special scales to detect whether a person is answering honestly and consistently (Butcher, 2010; Pope & others, 2006). For example, if someone responds "True" to items such as "I *never* put off until tomorrow what I should do today" and "I *always* pick up after myself," it's probably a safe bet that she is inadvertently or intentionally distorting her other responses.

The MMPI was originally designed to assess mental health and detect psychological symptoms. In contrast, the California Psychological Inventory and the Sixteen Personality Factor Questionnaire are personality inventories that were designed to assess normal populations (Boer & others, 2008; Megargee, 2009). Of the over 400 true–false items on the long version of the **California Psychological Inventory (CPI),** nearly half are drawn from the MMPI. The CPI provides measures on such characteristics as interpersonal effectiveness, self-control, independence, and empathy. Profiles generated by the CPI are used to predict such things as high school and college grades, delinquency, and job performance (see Crites & Taber, 2002).

The **Sixteen Personality Factor Questionnaire (16PF)** was originally developed by Raymond Cattell and is based on his trait theory. The 16PF uses a forced-choice format in which the person must respond to each item by choosing one of three alternatives. Just as the test's name implies, the results generate a profile on Cattell's 16 personality factors. Each personality factor is represented as a range, with a person's score falling somewhere along the continuum between the two extremes (see Figure 11.4). The 16PF is widely used for career counseling, marital counseling, and evaluating employees and executives (Clark & Blackwell, 2007; Cattell, H. E. P. & Mead, 2008).

Another widely used personality test is the *Myers-Briggs Type Indicator* (abbreviated *MBTI*). The MBTI was developed by Isabel Briggs Myers and Katharine Cook Briggs (see Gladwell, 2004; Quenk, 2009). Myers and Briggs were intrigued by Carl Jung's personality theory and his proposal that people could be categorized into discrete personality "types." The Myers-Briggs test differs from other self-report tests in that it is designed to assess personality *types* rather than measure personality *traits*.

The notion of personality types is fundamentally different from personality traits. According to trait theory, people display traits, such as introversion/extraversion, to varying degrees. If you took the 16PF or the CPI, your score would

TABLE 11.6

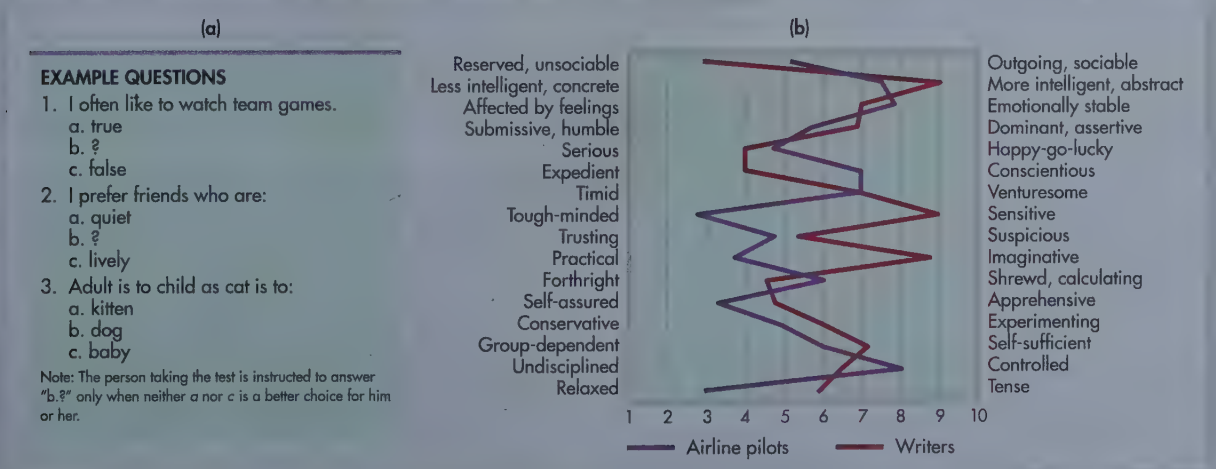
Simulated MMPI-2 Items

Most people will use somewhat unfair means to gain profit or an advantage rather than lose it.
I am often very tense on the job.
The things that run through my head sometimes are horrible.
Sometimes there is a feeling like something is pressing in on my head.
Sometimes I think so fast I can't keep up.
I am worried about sex.
I believe I am being plotted against.
I wish I could do over some of the things I have done.

Source: MMPI-2®.

FIGURE 11.4 The 16PF: Example Questions and Profiles The 16PF, developed by Raymond Cattell, is a self-report inventory that contains 185 items like those shown in part (a). When scored, the 16PF generates a personality profile. In part (b), personality profiles of airline pilots and writers are compared. Cattell (1973) found that pilots are more controlled, more relaxed, more self-assured, and less sensitive than writers.

Source: Cattell & others (1993).



place you somewhere along a continuum from low (very introverted) to high (very extraverted). However, most people would fall in the middle or average range on this trait dimension. But according to type theory, a person is *either* an extrovert *or* an introvert—that is, one of two distinct categories that don't overlap (Arnau & others, 2003; Wilde, 2011).

The MBTI arrives at personality type by measuring a person's *preferred* way of dealing with information, making decisions, and interacting with others. There are four basic categories of these preferences, which are assumed to be *dichotomies*—that is, opposite pairs. These dichotomies are: *Extraversion/Introversion; Sensing/Intuition; Thinking/Feeling;* and *Perceiving/Judging.*

There are 16 possible combinations of scores on these four dichotomies. Each combination is considered to be a distinct personality type. An individual personality type is described by the initials that correspond to the person's preferences as reflected in her MBTI score. For example, an ISFP combination would be a person who is *introverted, sensing, feeling,* and *perceiving,* while an ESTJ would be a person who is *extroverted, sensing, thinking,* and *judging.*

Despite the MBTI's widespread use in business, counseling, and career guidance settings, research has pointed to several problems with the MBTI. One problem is *reliability*—people can receive different MBTI results on different test-taking occasions. Equally significant is the problem of *validity.* For example, research does not support the claim of a relationship between MBTI personality types and occupational success (Pittenger, 2005). More troubling is the lack of evidence supporting the existence of 16 distinctly different personality types (Hunsley & others, 2003). Thus, most researchers in the field of psychological testing advise that caution be exercised in interpreting MBTI results, especially in applying them to vocational choices or predictions of occupational success (see Pittenger, 2005).

Strengths and Limitations of Self-Report Inventories

The two most important strengths of self-report inventories are their *standardization* and their *use of established norms* (see Chapter 7). Each person receives the same instructions and responds to the same items. The results of self-report inventories are objectively scored and compared to norms established by previous research. In fact, the MMPI, the CPI, and the 16PF can all be scored by computer.

As a general rule, the reliability and validity of self-report inventories are far greater than those of projective tests. Literally thousands of studies have demonstrated that the MMPI, the CPI, and the 16PF provide accurate, consistent results that can be used to generally predict behavior (Anastasi & Urbina, 1997).

However, self-report inventories also have their weaknesses. First, despite the inclusion of items designed to detect deliberate deception, there is considerable evidence that people can still successfully fake responses and answer in socially desirable ways (Anastasi & Urbina, 1997; Holden, 2008). Second, some people are prone to responding in a set way. They may consistently pick the first alternative or answer "True" whether the item is true for them or not. And some tests, such as the MMPI and CPI, include hundreds of items. Taking these tests can become quite tedious, and people may lose interest in carefully choosing the most appropriate response.

Third, people are not always accurate judges of their own behavior, attitudes, or attributes. And some people defensively deny their true feelings, needs, and attitudes, even to themselves (Cousineau & Shedler, 2006; Shedler & others, 1993). For example, a person might indicate that she enjoys parties, even though she actually avoids social gatherings whenever possible.

To sum up, personality tests are generally useful strategies that can provide insights about the psychological makeup of people. But no personality test, by itself, is likely to provide a definitive description of a given individual. In practice, psychologists and other mental health professionals usually combine personality test results with behavioral observations and background information, including interviews with family members, co-workers, or other significant people in the person's life.

CONCEPT REVIEW 11.4

Trait Theories and Personality Assessment

Circle the letter of the correct answer.

1. Trait theories focus on:
   a. individual differences
   b. individual similarities
   c. stages of personality development
   d. universal processes of motivation

2. Surface traits are to source traits as:
   a. aggression is to violent behavior
   b. friendly is to extraversion
   c. conscientiousness is to personality
   d. relaxed is to tense

3. After conducting research on personality traits for many years, Professor Torres concludes that traits can be described in terms of five basic factors. Professor Torres agrees with the trait model proposed by:
   a. Hans Eysenck
   b. Hermann Rorschach
   c. Paul Costa, Jr. and Robert McCrae
   d. Raymond Cattell

4. Imagine that a researcher has just discovered that the trait of "industriousness" is strongly influenced by genetics. If this were the case, which of the following pairs will be MOST alike on this trait?
   a. two same-sex siblings
   b. a mother and her firstborn child
   c. fraternal twins
   d. identical twins

5. Dana took the same personality test twice within three months. She obtained very different results each time. Which test did she most likely take?
   a. MMPI
   b. TAT
   c. 16PF
   d. CPI

6. A key strength of the MMPI and the 16PF is:
   a. they provide a wealth of qualitative information about the individual
   b. they are unstructured
   c. they are standardized
   d. their scoring relies on the examiner's expertise and clinical judgment



CLOSING THOUGHTS

Over the course of this chapter, you've encountered firsthand some of the most influential contributors to modern psychological thought. As you'll see in Chapter 14, the major personality perspectives provide the basis for many forms of psychotherapy. Clearly, the psychoanalytic, humanistic, social cognitive, and trait perspectives each provide a fundamentally different way of conceptualizing personality. That each perspective has strengths and limitations underscores the point that no single perspective can explain all aspects of human personality. Indeed, no one personality theory could explain why Kenneth and Julian were so different. And, given the complex factors involved in human personality, it's doubtful that any single theory ever will capture the essence of human personality in its entirety. Even so, each perspective has made important and lasting contributions to the understanding of human personality.

possible selves The aspect of the self-concept that includes images of the selves that you hope, fear, or expect to become in the future.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Possible Selves: Imagine the Possibilities

Some psychologists believe that a person's self-concept is not a singular mental self-image, as Carl Rogers proposed, but a *multi-faceted system* of related images and ideas (Hermans, 1996; Markus & Kunda, 1986). This collection of related images about yourself reflects your goals, values, emotions, and relationships (Markus & Cross, 1990; Markus & Wurf, 1987; Unemori & others, 2004).

According to psychologist Hazel Markus and her colleagues, an important aspect of your self-concept has to do with your images of the selves that you *might* become—your **possible selves**. Possible selves are highly personalized, vivid, futuristic images of the self that reflect hopes, fears, and fantasies. As Markus and co-researcher Paula Nurius (1986) wrote, "The possible selves that are hoped for might include the successful self, the creative self, the rich self, the thin self, or the loved and admired self, whereas the dreaded possible selves could be the alone self, the depressed self, the incompetent self, the alcoholic self, the unemployed self, or the bag lady self."

The Influence of Hoped-For and Dreaded Possible Selves

Possible selves are more than just idle daydreams or wishful fantasies. In fact, possible selves influence our behavior in important ways (Markus & Nurius, 1986; Oyserman & James, 2011). We're often not



aware of the possible selves that we have incorporated into our self-concepts. Nevertheless, they can serve as powerful forces that either activate or stall our efforts to reach important goals. Your incentive, drive, and motivation are greatly influenced by your possible selves, and so are your decisions and choices about future behavior (Hoyle & Sherrill, 2006; Robinson & others, 2003).

Imagine that you harbor a hoped-for possible self of becoming a professional musician. You would probably practice with greater regularity and intensity than someone who does not hold a vivid mental picture of performing solo at Carnegie Hall or being named Performer of the Year at the American Country Music Awards.

Dreaded possible selves can also influence behavior, whether they are realistic or not. Consider Don's father, Kenneth. Although never wealthy, Kenneth was financially secure throughout his long life. Yet Kenneth had lived through the Great Depression and witnessed first-hand the financial devastation that occurred in the lives of countless people. Kenneth seems to have harbored a dreaded possible self of becoming penniless. When Kenneth died, the family found a $100 bill tucked safely under his mattress.

A positive possible self, even if it is not very realistic, can protect an individual's self-esteem in the face of failure (Markus & Nurius, 1986). A high school girl who thinks she is unpopular with her classmates may console herself with visions of a possible self as a famous scientist who snubs her intellectually inferior classmates at her 10-year class reunion. As Hazel Markus and Paula Nurius (1986) explained:

> Positive possible selves can be exceedingly liberating because they foster hope that the present self is not immutable. At the same time, negative possible selves can be powerfully imprisoning because their [emotional impact] and expectations may stifle attempts to change or develop.

Possible Selves, Self-Efficacy Beliefs, and Motivation

Self-efficacy beliefs are closely connected to the idea of possible selves. Performing virtually any task involves the construction of a possible self that is capable and competent of performing the action required (Ruvolo & Markus, 1992).

Thus, people who vividly imagine possible selves as "successful because of hard work" persist longer and expend more effort on tasks than do people who imagine themselves as "unsuccessful despite hard work" (Ruvolo & Markus, 1992). The motivation to achieve academically increases when your possible selves include a future self who is successful because of academic achievement (Oyserman & James, 2011). To be most effective, possible selves should incorporate concrete strategies for attaining goals. For example, students who visualized themselves taking specific steps to improve their grades—such as doing homework daily or signing up for tutoring—were more successful than students who simply imagined themselves doing better in school (Oyserman & others, 2004).

Applying the Research: Assessing Your Possible Selves

How can you apply these research findings to *your* life? First, it's important to stress again that we're often unaware of how the possible selves we've mentally constructed influence our beliefs, actions, and self-evaluations. Thus, the first step is to consciously assess the role that your possible selves play in your life (Oyserman & James, 2011).

Take a few moments and jot down the "possible selves" that are active in your working self-concept. To help you in this task, write three responses to each of the following questions:

1. Next year, I expect to be . . .
2. Next year, I am afraid that I will be . . .
3. Next year, I want to avoid becoming . . .

After focusing on the short-term future, take these same questions and extend them to 5 years from now or even 10 years from now. Most likely, certain themes and goals will consistently emerge. Now the critical questions:

- How are your possible selves affecting your *current* motivation, goals, feelings, and decisions?
- Are your possible selves even remotely plausible?
- Are they pessimistic and limiting?
- Are they unrealistically optimistic?

Finally, ask yourself honestly: What realistic strategies are you using to try to become the self that you want to become? To avoid becoming the selves that you dread?

How can you improve the likelihood that you will achieve some of your possible selves? One approach is to link your expectations and hopes to concrete strategies about how to behave to reach your desired possible self (Oyserman & others, 2004).

These questions should help you gain some insight into whether your possible selves are influencing your behavior in productive, constructive ways. If they are not, now is an excellent time to think about replacing or modifying the possible selves that operate most powerfully in your own self-concept. Why is this so important? Because to a large extent, who we become is guided by who we *imagine* we'll become. Just imagine the possibilities of who *you* could become!

CHAPTER REVIEW

Personality

KEY POINTS

Introduction: What Is Personality?

- **Personality** is defined as an individual's unique and relatively consistent patterns of thinking, feeling, and behaving. **Personality theories** attempt to explain how people are similar in these patterns, why they are different, and why every individual is unique.
- The four major theoretical perspectives on personality are the psychoanalytic, humanistic, social cognitive, and trait perspectives.

The Psychoanalytic Perspective on Personality

- **Psychoanalysis** was founded by Sigmund Freud. It stresses the unconscious, the importance of sex and aggression, and the influence of early childhood experience. Freud's theory was extremely controversial throughout his lifetime and remains so today.
- Freud believed that behavior is strongly influenced by the unconscious. The contents of the **unconscious** can surface in disguised form in **free associations,** dreams, slips of the tongue, and apparent accidents.
- Personality consists of three psychological processes: id, ego, and superego. The **id** is fueled by instinctual energy and ruled by the **pleasure principle.** The two instinctual drives are **Eros,** the life instinct, and **Thanatos,** the death instinct. **Libido** is the psychological and emotional energy associated with the sex drive. The **ego** is partly conscious and is ruled by the **reality principle.** The **superego** is partly conscious and represents internalized moral values and rules.
- Anxiety results when the demands of the id or the superego threaten to overwhelm the ego. **Ego defense mechanisms** reduce anxiety by distorting either thoughts or reality. **Repression** is involved in all ego defense mechanisms. **Displacement** is a defense mechanism involving the unconscious shifting of emotional impulses to a less threatening substitute target. **Sublimation** is a special form of displacement.
- The **psychosexual stages** are age-related developmental periods in which sexual impulses are expressed through different bodily zones and activities associated with those areas. The foundations of adult personality are established during the first five years of life by the child's progression through the oral, anal, and phallic stages. One result of the **Oedipus complex** is that children come to imitate the behavior and characteristics of the same-sex parent, a process Freud called **identification.** Fixation at a particular stage may result if the developmental conflicts are not successfully resolved. The latency and genital stages occur during late childhood and adolescence, respectively.
- The neo-Freudians believed in the importance of the unconscious and early childhood experience but disagreed with other aspects of Freud's theory. Carl Jung emphasized psychological growth and proposed the existence of the **collective unconscious** and **archetypes.** Karen Horney emphasized the role of social relationships in protecting against basic anxiety. Horney objected to Freud's views on female development, particularly his idea of penis envy. Alfred Adler believed that the most fundamental human motive was to strive for superiority.
- Freud's theory has been criticized for resting on insufficient evidence, being difficult to test, and being sexist.

The Humanistic Perspective on Personality

- **Humanistic psychology** was championed as the "third force" in psychology. It emphasized human potential, psychological growth, self-awareness, and free will. Important humanistic theorists were Carl Rogers and Abraham Maslow.
- Rogers believed that the most basic human motive was the **actualizing tendency.** He viewed the **self-concept** as the most important aspect of personality. **Conditional positive regard** by parents or other caregivers causes a person to deny or distort aspects of experience, leading to a state of incongruence with regard to the self-concept. In contrast, **unconditional positive regard** leads to a state of congruence. The fully functioning person experiences congruence, the actualizing tendency, and psychological growth.
- The humanistic perspective on personality has been criticized for being difficult to validate or test scientifically and for being too optimistic.

The Social Cognitive Perspective on Personality

- Albert Bandura's **social cognitive theory** stresses the role of conscious thought processes, goals, and self-regulation. **Reciprocal determinism** emphasizes the interaction of behavioral, cognitive, and environmental factors in behavior and personality.
- **Self-efficacy** beliefs influence behavior, performance, motivation, and persistence.
- Social cognitive theories emphasize the interaction of multiple factors in determining personality and behavior. Although a key strength of this perspective is its grounding in empirical research, it has been criticized for its limited view of human personality, which ignores unconscious conflicts and emotions.

The Trait Perspective on Personality

- **Trait theories** focus on measuring and describing individual differences, or **traits. Surface traits** can be easily inferred from observable behaviors. **Source traits** are thought to represent the basic, fundamental dimensions of personality.
- Raymond Cattell believed that there were 16 basic personality factors. Hans Eysenck proposed that there were three basic personality dimensions: extraversion–introversion, neuroticism–emotional stability, and psychoticism. Eysenck believed that the extraversion–introversion dimension might reflect physiological differences.

- According to the **five-factor model,** there are five basic personality dimensions: extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience.
- Traits are generally stable over time and across situations, although situations do influence how and whether traits are expressed.
- **Behavioral genetics** research uses twin and adoption studies to measure the relative influence of genetics and environment. Extraversion, neuroticism, openness to experience, and conscientiousness seem to have a significant genetic component.
- The trait perspective is useful in describing individual differences and in predicting behavior. Trait theories have been criticized for their failure to explain human personality and the development of individual differences.

Assessing Personality: Psychological Tests

- Valid **psychological tests** accurately reflect personal characteristics on some dimension and predict future psychological functioning or behavior. The two basic types of personality tests are projective tests and self-report inventories. **Projective tests** developed out of the psychoanalytic approach and include the **Rorschach Inkblot Test** and the **Thematic Apperception Test.**
- Projective tests provide qualitative information about an individual. They have some limitations: Responses may be affected by the examiner or the situation; scoring is very subjective; results may be inconsistent; and they do not predict behavior well.
- **Self-report inventories** are objectively scored and differentiate among people on particular personality characteristics. Self-report inventories include the **MMPI, CPI,** and **16PF.** The reliability, validity, and predictive value of self-report inventories are high. However, people do not always respond honestly or accurately to items in self-report inventories. Psychological tests provide just one measure of personality at a particular point in time.

KEY TERMS

personality, p. 445
personality theory, p. 445
psychoanalysis, p. 445
free association, p. 446
unconscious, p. 447
id, p. 448
Eros, p. 448
libido, p. 448
Thanatos, p. 448
pleasure principle, p. 448
ego, p. 449
reality principle, p. 449
superego, p. 449
ego defense mechanisms, p. 450
repression, p. 450
displacement, p. 450
sublimation, p. 450
psychosexual stages, p. 452
Oedipus complex, p. 452
identification, p. 452
collective unconscious, p. 455
archetypes, p. 455
humanistic psychology, p. 459
actualizing tendency, p. 460
self-concept, p. 460
conditional positive regard, p. 462
unconditional positive regard, p. 462
social cognitive theory, p. 464
reciprocal determinism, p. 464
self-efficacy, p. 464
trait, p. 467
trait theory, p. 467
surface traits, p. 467
source traits, p. 467
five-factor model of personality, p. 469
behavioral genetics, p. 470
psychological test, p. 474
projective test, p. 474
Rorschach Inkblot Test, p. 474
graphology, p. 475
Thematic Apperception Test (TAT), p. 476
self-report inventory, p. 476
Minnesota Multiphasic Personality Inventory (MMPI), p. 476
California Psychological Inventory (CPI), p. 477
Sixteen Personality Factor Questionnaire (16PF), p. 477
possible selves, p. 479

KEY PEOPLE

Alfred Adler (1870–1937) Austrian physician who broke with Sigmund Freud and developed his own psychoanalytic theory of personality, which emphasized social factors and the motivation toward self-improvement and self-realization; key ideas include the inferiority complex and the superiority complex. (p. 457)

Albert Bandura (b. 1925) Contemporary American psychologist who is best known for his research on observational learning and his social cognitive theory of personality; key ideas include self-efficacy beliefs and reciprocal determinism. (p. 463)

Raymond Cattell (1905–1998) British-born American psychologist who developed a trait theory that identifies 16 essential source traits or personality factors; also developed the widely used self-report personality test, the Sixteen Personality Factor Questionnaire (16PF). (p. 468)

Hans Eysenck (1916–1997) German-born British psychologist who developed a trait theory of personality that identifies the three basic dimensions of personality as neuroticism, extraversion, and psychoticism. (p. 468)

Sigmund Freud (1856–1939) Austrian neurologist who founded psychoanalysis, which is both a comprehensive theory of personality and a form of psychotherapy; emphasized the role of unconscious determinants of behavior and early childhood experiences in the development of personality and psychological problems; key ideas include the id, ego, and superego; the psychosexual stages of development; and the ego defense mechanisms. (p. 445)

Karen Horney (1885–1952) German-born American psychoanalyst who emphasized the role of social relationships and culture in personality; sharply disagreed with Freud's characterization of female psychological development, especially his notion that women suffer from penis envy; key ideas include basic anxiety and womb envy. (p. 456)

Carl G. Jung (1875–1961) Swiss psychiatrist who broke with Sigmund Freud to develop his own psychoanalytic theory of personality, which stressed striving toward psychological harmony; key ideas include the collective unconscious and archetypes. (p. 455)

Abraham Maslow (1908–1970) American psychologist who was one of the founders of humanistic psychology and emphasized the study of healthy personality development; developed a hierarchical theory of motivation based on the idea that people will strive for self-actualization, the highest motive, only after more basic needs have been met; key ideas include the hierarchy of needs and self-actualization. (p. 460)

Carl Rogers (1902–1987) American psychologist who was one of the founders of humanistic psychology; developed a theory of personality and form of psychotherapy that emphasized the inherent worth of people, the innate tendency to strive toward one's potential, and the importance of the self-concept in personality development; key ideas include the actualizing tendency and unconditional positive regard. (p. 460)

CONCEPT REVIEW ANSWERS

11.1 page 454

1. d 2. c 3. b 4. b 5. a 6. c

11.2 page 457

1. Freud 2. Horney 3. Adler 4. Jung
5. Freud 6. Horney

11.3 page 466

1. False. Rogers believed it is the parents' responsibility to guide and control their children's behavior.
2. False. Rogers advocated the use of unconditional positive regard.
3. True
4. True
5. False. Social cognitive theory holds that human behavior is determined by the interaction of environmental, cognitive, and behavioral factors.
6. True
7. True

11.4 page 479

1. a 2. b 3. c 4. d 5. b 6. c



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CHAPTER 12

Social Psychology











The "Homeless" Man

PROLOGUE

REMEMBER ERV AND FERN, Sandy's parents, from Chapter 5? A few years ago, Fern and Erv got two free plane tickets when they were bumped from an overbooked flight. They decided to visit a city they had always wanted to see—San Francisco. Even though Fern was excited about the trip, she was also anxious about visiting the earthquake zone. Erv wasn't especially worried about earthquakes, but he was worried about whether his old army buddy could still beat him at penny poker. Mostly, they both wanted to see the famous sights, eat seafood, wander through shops, and explore used bookstores, which was Erv's favorite hobby.

As it turned out, Fern and Erv were both quite taken by the beauty and charm of San Francisco. But they were also disturbed by the number of homeless people they saw on the city streets, sometimes sleeping in the doorways of expensive shops and restaurants. This was especially disturbing to Fern, who has a heart of gold and is known among her family and friends for her willingness to help others, even complete strangers.

On the third morning of their San Francisco visit, Erv and Fern were walking along one of the hilly San Francisco streets near the downtown area. That's when Fern saw a scruffy-looking man in faded jeans sitting on some steps, holding a cup. Something about his facial expression struck Fern as seeming lost, maybe dejected. Surely this was one of San Francisco's less fortunate, Fern thought to herself. Without a moment's hesitation, Fern rummaged through her purse, walked over to the man, and dropped a handful of quarters in his cup.

"Hey, lady! What the hell d'ya think you're doing!?!" the man exclaimed, jumping up.

"Oh, my! Aren't you homeless!?" Fern asked, mortified and turning bright red.

"Lady, this *is* my home," the man snapped, motioning with his thumb to the house behind him. "I live here! And that's my cup of coffee you just ruined!"

Fortunately, the "homeless" man also had a sense of humor. After fishing Fern's quarters out of his coffee and giving them back to her, he chatted with the out-of-towners, enlightening them on the extraordinary cost of San Francisco real estate. As they parted, the not-so-homeless man ended up recommending a couple of his favorite seafood restaurants.

Like Fern, we all try to make sense out of our social environments. As we navigate the world, we constantly make judgments about the traits, motives, and goals of other people. And, like Fern, sometimes we make mistakes!

In this chapter, we will look at how we interpret our social environment, including how we form impressions of other people and explain their behavior. We'll explore how our own behavior, including our willingness to help others, is influenced by the social environment and other people. In the process, we'll come back to Erv and Fern's incident with the "homeless" man to illustrate several important concepts.

IN THIS CHAPTER:

- Introduction: What Is Social Psychology?
- Person Perception: Forming Impressions of Other People
- Attribution: Explaining Behavior
- The Social Psychology of Attitudes
- Understanding Prejudice
- Conformity: Following the Crowd
- Obedience: Just Following Orders
- Helping Behavior: Coming to the Aid of Strangers
- The Influence of Groups on Individual Behavior
- ENHANCING WELL-BEING WITH PSYCHOLOGY: The Persuasion Game



Introduction: What Is Social Psychology?

Why did Fern think the man on the steps was homeless? How did the "homeless" man initially interpret Fern's efforts to help him? And in contrast to Fern, not everyone who feels compassion toward homeless people acts in accordance with that attitude. Why did Fern do so?

These are the kinds of issues that social psychologists study. **Social psychology** investigates how your thoughts, feelings, and behavior are influenced by the presence of other people and by the social and physical environment. The social situations can include being alone, in the presence of others, or in front of a crowd of onlookers.

Like other psychology specialty areas, social psychology emphasizes certain concepts. For example, one important social psychology concept is that of your *self*. Your **sense of self** involves you as a social being that has been shaped by your interactions with others and by the social environments, including the culture, in which you operate. Thus, your sense of self plays a key role in how you perceive and react to others.

Some social behaviors, such as helping others, are displayed *universally*—that is, they take a consistent form in diverse cultures. When a specific social behavior is universal, social psychologists will often use insights from evolutionary psychology to understand how the behavior is adaptive.

As we discussed in Chapter 1, *evolutionary psychology* is based on the premise that certain psychological processes and behavior patterns evolved over hundreds of thousands of years. Those patterns evolved because in some way they were adaptive, increasing the odds of survival for humans who displayed those qualities. In turn, this survival advantage increased the genetic transmission of those patterns to subsequent generations (see Buss, 2008; Neuberg & others, 2010).

Social psychology research focuses on many different topics. In this chapter, we'll focus on two key research areas in social psychology. We'll start with an area that has been greatly influenced by the experimental methods and findings of *cognitive psychology*, which we discussed in Chapter 7. **Social cognition** refers to how we form impressions of other people, how we interpret the meaning of other people's behavior, and how our behavior is affected by our attitudes (Bodenhausen & others, 2003). As you'll see, sometimes those mental processes are conscious and deliberate but, at other times, they occur automatically and outside of our awareness.

Later in the chapter, we'll look at **social influence,** which focuses on how our behavior is affected by other people and by situational factors. The study of social influence includes such questions as why we conform to group norms, what compels us to obey an authority figure, and under what circumstances we will help a stranger.

social psychology Branch of psychology that studies how a person's thoughts, feelings, and behavior are influenced by the presence of other people and by the social and physical environment.

sense of self An individual's unique sense of identity that has been influenced by social, cultural, and psychological experiences; your sense of who you are in relation to other people.

social cognition The mental processes people use to make sense of their social environments.

social influence The effects of situational factors and other people on an individual's behavior.

person perception The mental processes we use to form judgments and draw conclusions about the characteristics and motives of other people.

social norms The "rules," or expectations, for appropriate behavior in a particular social situation.



Person Perception

Forming Impressions of Other People

KEY THEME

› Person perception refers to the mental processes we use to form judgments about other people.

KEY QUESTIONS

› What four principles are followed in the person perception process?

› How do social categorization, implicit personality theories, and physical attractiveness affect person perception?

Consider the following scenario. You're attending college in a big city and commute from your apartment to campus via the subway. Today the subway is more than half full. If you want to sit down, you'll have to share a seat with some other passenger. You quickly survey your fellow passengers. In a matter of seconds, you must decide which stranger you'll share your ride home with, elbow to elbow, thigh to thigh. How will you decide?

Whether it's a seat on the subway or in a crowded movie theater, this is a task that most of us confront almost every day: On the basis of very limited information, we must quickly draw conclusions about the nature and likely behavior of people who are complete strangers to us. How do we arrive at these conclusions?

Person perception refers to the mental processes we use to form judgments and draw conclusions about the characteristics of other people. Person perception is an active, subjective process that always occurs in some *interpersonal context* (Macrae & Quadflieg, 2010; Smith & Collins, 2009).

In the interpersonal context of a subway car, you evaluate people based on minimal interaction. You form very rapid *first impressions* largely by looking at other people's faces (Macrae & others, 2005; Zebrowitz & Montepare, 2008). In a mere tenth of a second, you evaluate the other person's attractiveness, likeability, competence, trustworthiness, and aggressiveness (Willis & Todorov, 2006). Four key components influence your decision:

- the characteristics of the person you are trying to evaluate
- your own self-perception
- your goals in the situation, and
- the specific situation in which the process occurs.

Each component plays a role in some basic principles that guide person perception (see Ambady & Skowronski, 2008; Zebrowitz & Montepare, 2006). Let's illustrate those principles using the subway scenario.



Janine Wiedel/drr.net

Making Split-Second Decisions About Strangers Deciding where to sit in a subway car or on a bus involves making rapid evaluations and decisions about people who are complete strangers. What kinds of factors do you notice in forming your first impressions of other people? Do the impressions you form seem to be the result of deliberate or automatic thoughts? Do you think your first impressions are generally accurate?

Principle 1. Your reactions to others are determined by your perceptions of them, not by who they really are. On the subway, you quickly choose not to sit next to the big guy with a scowl on his face. Why? Because *you* perceive him as threatening. Of course, he could be a burly florist who's surly because he's getting home late. It doesn't matter. Your behavior toward him is determined by your subjective perception of him.

Principle 2. Your self-perception also influences how you perceive others and how you act on your perceptions. Your decision about where to sit is also influenced by how you perceive yourself (Macrae & Quadflieg, 2010). For example, if you think of yourself as looking intimidating (even though you're really a mild-mannered marketing major), you may choose not to sit next to the anxious-looking woman clutching her purse with both hands.

Principle 3. Your goals in a particular situation determine the amount and kinds of information you collect about others. If your goal is to share a subway seat with someone who will basically leave you alone, you will look for characteristics that are relevant to that goal. In this case, you'll probably pick a seatmate wearing telltale white earbuds who is obviously listening to music, or perhaps someone immersed in a book or magazine (Goodwin & others, 2002; Hilton, 1998).

Principle 4. In every situation, you evaluate people partly in terms of how you expect them to act. Whether you're in a classroom, restaurant, or public restroom, your behavior is governed by **social norms**—the "rules," or expectations, for appropriate behavior in that social situation (Milgram, 1992). On the subway, for example, you don't sit next to someone else when empty seats are available, and you don't read your seatmate's text messages. These "subway rules" aren't posted anywhere, of course. Nevertheless, violating these social norms will draw attention from others, as in the cartoon to the right!



"Goodbye everybody."

©The New Yorker Collection 2004 Robert Leighton from cartoonbank.com. All rights reserved.

What these four guiding principles demonstrate is that person perception is not a one-way process in which we objectively survey other people and then logically evaluate their characteristics. Instead, the perceptions we have

social categorization The mental process of categorizing people into groups (or *social categories*) on the basis of their shared characteristics.

explicit cognition Deliberate, conscious mental processes involved in perceptions, judgments, decisions, and reasoning.

implicit cognition Automatic, nonconscious mental processes that influence perceptions, judgments, decisions, and reasoning.

implicit personality theory A network of assumptions or beliefs about the relationships among various types of people, traits, and behaviors.

of others, our self-perceptions and goals, and the specific context all interact. Each component plays a role in the split-second judgments we form of complete strangers.

On a short subway ride, as in other transient situations, you'll probably never learn whether your first impressions were accurate or not. But in situations that involve long-term relationships with other people, such as in a classroom or at work, we fine-tune our impressions as we acquire additional information about the people we come to know (Smith & Collins, 2009).

Social Categorization

Using Mental Shortcuts in Person Perception

Along with person perception, the subway scenario illustrates our natural tendency to group people into categories. **Social categorization** is the mental process of classifying people into groups on the basis of common characteristics.

So how do you socially categorize people who are complete strangers, such as the other passengers on the subway? To a certain extent, you consciously focus on easily observable features, such as the other person's gender, age, or clothing (Kinzler & others, 2010; Miron & Branscomben, 2008). With a quick glance, you might socially categorize someone as "Asian male, 20-something, fraternity sweatshirt, probably a college student." Social psychologists use the term **explicit cognition** to refer to these deliberate, conscious mental processes involved in perceptions, judgments, decisions, and reasoning.

However, your social perceptions are not always completely conscious considerations. In many situations, you react to another person with automatic social perceptions, categorizations, and attitudes. Social psychologists use the term **implicit cognition** to describe the mental processes associated with automatic, nonconscious social evaluations (Gawronski & Payne, 2010).

Prior experiences and beliefs about different social categories can trigger implicit social reactions ranging from very positive to very negative (Nosek & others, 2007). Without consciously realizing it, your reaction to another person can be swayed by characteristics such as ethnicity, weight, sexual orientation, or religious beliefs.

We often assume that certain types of people share certain traits and behaviors. This is referred to as an **implicit personality theory.** Different models exist to explain how implicit personality theories develop and function (e.g., Fiske & others, 2002; Ybarra, 2002). But in general terms, your previous social and cultural experiences influence the cognitive *schemas*, or mental frameworks, you hold about the traits and behaviors associated with different "types" of people. So when you perceive someone to be a particular "type," you assume that the person will display those traits and behaviors (see Uleman & others, 2008).

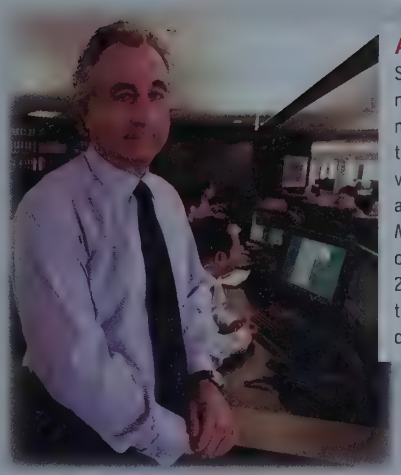
Physical appearance cues play an important role in person perception and social categorization. Particularly influential is the implicit personality theory that most



Using Social Categories We often use superficial cues such as clothing and context to assign people to social categories and draw conclusions about their behavior. For example, you might characterize one person in this crowd as belonging to the category of "businessman" because he is wearing a suit and checking his voice mail—and conclude that he is on his way to work. What other sorts of social categories are evident here?

Kike Calvo via AP Images

people have for physically attractive people (see Anderson & others, 2008; Lemay & others, 2010). Starting in childhood, we are bombarded with the cultural message that "what is beautiful is good." In myths, fairy tales, cartoons, movies, and games, heroes are handsome, heroines are beautiful, and the evil villains are ugly (Bazzini & others, 2010). As a result of such cultural conditioning, most people have an implicit personality theory that associates physical attractiveness with a wide range of desirable characteristics.



Ruby Washington/The New York Times/Redux

A Charitable Guy? As a highly successful Wall Street financial adviser, Bernie Madoff managed money for individuals, financial institutions, and numerous charitable foundations, including director Steven Spielberg's Wunderkinder Foundation. A well-known philanthropist, he also gave substantial amounts of his own money to charities. But Bernie Madoff was actually a crook, swindling his clients out of billions of dollars over a period of more than 20 years. In what ways could implicit personality theories help explain how Madoff got away with his crimes for so long?

Decades of research have shown that good-looking people are perceived as being more intelligent, happier, and better adjusted than other people (Eagly & others, 1991; Lorenzo & others, 2010). In an extensive meta-analysis, Judith Langlois and her colleagues (2000) found that people tend to attribute a wide range of positive qualities to attractive individuals, viewing them as being more intelligent, strong, sensitive, honest, sociable, assertive, and emotionally stable. Attractiveness also seems to bring tangible rewards. In general, attractive people earn higher wages and are more satisfied with life (Hamermesh, 2011).

But are beautiful people *actually* happier, smarter, or more successful than the rest of us? Economists Daniel Hamermesh and Jason Abrevya (2011) analyzed data from surveys conducted in four countries and concluded that more attractive people *do* tend to be happier, primarily because they also tended to have improved economic outcomes, such as higher salaries and more successful spouses.

Some studies have found that attractive people also tend to be higher in self-esteem, intelligence, and other desirable personality traits than people of more average appearance (Langlois & others, 2000; Sheppard & others, 2011). Why? One possibility is that, beginning in infancy and continuing throughout their lives, they receive more attention and more favorable treatment from other people, such as parents, teachers, employers, and peers (Langlois & others, 1995; Sheppard & others, 2011).

The attention that beautiful people receive from those around them may be due to the positive emotional responses they evoke (Lemay & others, 2010). The Focus on Neuroscience on the next page discusses evidence demonstrating that there may be a brain-based reason for the greater social success of beautiful people.

Obviously, the social categorization process has both advantages and disadvantages. Relegating someone to a social category on the basis of superficial information ignores that person's unique qualities. In effect, you're jumping to sweeping conclusions about another person on the basis of very limited information. Sometimes these conclusions are wrong, as Fern's was when she categorized the scruffy-looking San Francisco man with a cup in his hand as homeless.

On the other hand, relying on social categories is a natural, adaptive, and efficient cognitive process. Social categories provide us with considerable basic information about other people. Knowing that basic information helps us organize and remember information about others more effectively. And from an evolutionary perspective, the ability to make rapid judgments about strangers is probably an evolved characteristic that conferred survival value in our evolutionary past.



The Kobel Collection/Disney Enterprises

What Is Beautiful Is Good We are culturally conditioned to associate beauty with goodness and evil with ugliness—an implicit personality theory that has been dubbed the "what is beautiful is good" myth (Sheppard & others, 2011). For example, in this scene from the Disney film *Enchanted*, the sweet, innocent princess is beautifully dressed and perfectly groomed. But the wicked stepmother is disguised as an old woman, complete with a wart on her chin.

FOCUS ON NEUROSCIENCE

Brain Reward When Making Eye Contact with Attractive People

How does physical attractiveness contribute to social success? A study by neuroscientists Knut Kampe and his colleagues (2001) at University College London may offer some insights. In a functional magnetic resonance imaging (fMRI) study, participants were scanned while they looked at color photographs of 40 different faces, some looking directly at the viewer (eye-contact) and some glancing away (non-eye-contact). After the fMRI scanning session, participants rated the attractiveness of the faces they had seen.

The results showed that when we make direct eye contact with a physically attractive person, an area on each side of the brain called the *ventral striatum* is activated (yellow areas in fMRI scan). When the attractive person's eye gaze is shifted away from the viewer, activity in the ventral striatum decreases. What makes this so interesting is that the ventral striatum is a brain area that predicts reward (Bray & O'Doherty, 2007). Neural activity in the ventral striatum increases when an unexpected reward, such as food or water, suddenly appears. Conversely, activity in the ventral striatum decreases when an expected reward fails to appear.

As Kampe (2001) explains, "What we've shown is that when we make eye contact with an attractive person, the brain area that predicts reward starts firing. If we see an attractive person but cannot make eye contact with that person, the activity in this region goes down, signaling disappointment. This is the first study to show that the brain's ventral striatum processes rewards in the context of human social interaction."

Other neuroscientists have identified additional brain reward areas that are responsive to facial attractiveness (see Chatterjee, 2011). Of particular note is the *orbital frontal cortex*, which is a region of the *frontal cortex* located just above the orbits (or sockets) of your eyes, and the *nucleus accumbens*, which is also associated with the brain's reward system (Cloutier & others, 2008). Another region is the *amygdala*. The orbital frontal cortex, the nucleus accumbens, and the amygdala are all selectively responsive to the reward value of attractive faces (Chatterjee, 2011). This suggests that viewing attractive faces tends to activate many of the same brain areas that are involved in processing other types of pleasurable stimuli.

"Facial beauty evokes a widely distributed neural network involving perceptual, decision-making, and reward circuits. [It] may serve as a neural trigger for the pervasive effects of attractiveness in social interactions," writes neuroscientist Anjan Chatterjee and his colleagues (2009). Apparently, the social advantages associated with facial attractiveness are reinforced by reward processing in the brain.

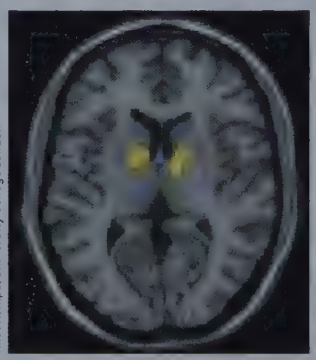
Eye-Contact Face



Non–Eye-Contact Face



Knut Kampe, University College London



Knut Kampe, University College London



Attribution

Explaining Behavior

KEY THEME

› Attribution refers to the process of explaining your own behavior and the behavior of other people.

KEY QUESTIONS

› What are the fundamental attribution error and the self-serving bias?

› How do attributional biases affect our judgments about the causes of behavior?

› How does culture affect attributional processes?

As you're studying in the college library, the activities of two workers catch your attention. The two men are getting ready to lift and move a large file cabinet. "Okay, let's tip it this way and lift it," the first guy says with considerable authority. The second guy sheepishly nods agreement. In unison, they heave and tip the file cabinet. When they do, the top two file drawers fly out, smashing into the first guy's head. As the file cabinet goes crashing to the floor, you bite your lip to keep from laughing and think to yourself, "What a pair of 40-watt bulbs."

Why did you arrive at that conclusion? After all, it's completely possible that the workers are not dimwits. Maybe the lock on the file drawers slipped or broke when they tipped the cabinet. Or maybe someone failed to empty the drawers.

Attribution is the process of inferring the cause of someone's behavior, including your own. Psychologists also use the word *attribution* to refer to the explanation you make for a particular behavior. The attributions you make strongly influence your thoughts and feelings about other people.

If your explanation for the file cabinet incident was that the workers were a couple of clumsy doofuses, you demonstrated a common cognitive bias. The **fundamental attribution error** is the tendency to spontaneously attribute the behavior of others to internal, personal characteristics, while ignoring or underestimating the role of external, situational factors (Ross, 1977). Even though it's entirely possible that situational forces were behind another person's behavior, we tend to automatically assume that the cause is an internal, personal characteristic (Bauman & Skitka, 2010; Zimbardo, 2007).

Notice, however, that when it comes to explaining our *own* behavior, we tend to be biased in the opposite direction. Rather than internal, personal attributions, we're more likely to explain our own behavior using *external, situational* attributions. He dropped the file cabinet because he's a dimwit; you dropped the file cabinet because there wasn't a good way to get a solid grip on it. Some jerk pulled out in front of your car because she's a reckless, inconsiderate moron; you pulled out in front of her car because an overgrown hedge blocked your view (Hennessy & others, 2005). And so on.

Why the discrepancy in accounting for the behavior of others as compared to our own behavior? Part of the explanation is that we simply have more information about the potential causes of our own behavior than we do about the causes of other people's behavior. When you observe another driver turn directly into the path of your car, that's typically the only information you have on which to judge his or her behavior. But when *you* inadvertently pull in front of another car, you perceive your own behavior in the context of the various situational factors that influenced your action. You're aware of such factors as visual obstacles, road conditions, driving distractions, and so forth. You also know what motivated your behavior and how differently you have behaved in similar situations in the past. Thus, you're much more aware of the extent to which your behavior has been influenced by situational factors (Jones, 1990).

The fundamental attribution error plays a role in a common explanatory pattern called **blaming the victim.** The innocent victim of a crime, disaster, or serious illness is blamed for having somehow caused the misfortune or for not having taken steps to prevent it. For example, many people blame the poor for their dire straits, the sick for bringing on their illnesses, and battered women and rape survivors for somehow "provoking" their attackers.

The blaming the victim explanatory pattern is reinforced by another common cognitive bias. **Hindsight bias** is the tendency, after an event has occurred, to overestimate one's ability to have foreseen or predicted the outcome. In everyday conversations, this is the person who confidently proclaims *after* the event, "I could have told you that would happen" or "I can't believe they couldn't see that coming." In the case of blaming the victim, hindsight bias makes it seem as if the victim should have been able to predict—and prevent—what happened (Goldinger & others, 2003).

Why do people often resort to blaming the victim? People have a strong need to believe that the world is fair—that "we get what we deserve and deserve what we get." Social psychologist Melvin Lerner (1980) calls this the **just-world hypothesis.** Blaming the victim reflects the belief that, because the world is just, the victim must have done something to deserve his or her fate. Collectively, these cognitive biases and explanatory patterns help psychologically insulate us from the uncomfortable thought "It could have just as easily been me" (Alves & Correia, 2008; Ijzerman & Van Prooijen, 2008).

- **attribution** The mental process of inferring the causes of people's behavior, including one's own. Also refers to the explanation made for a particular behavior.
- **fundamental attribution error** The tendency to attribute the behavior of others to internal, personal characteristics, while ignoring or underestimating the effects of external, situational factors; an attributional bias that is common in individualistic cultures.
- **blaming the victim** The tendency to blame an innocent victim of misfortune for having somehow caused the problem or for not having taken steps to avoid or prevent it.
- **hindsight bias** The tendency to overestimate one's ability to have foreseen or predicted the outcome of an event.
- **just-world hypothesis** The assumption that the world is fair and that therefore people get what they deserve and deserve what they get.

Blaming the Victim Fifteen-year-old Shawn Hornbeck is shown at a press conference shortly after being reunited with his family. Four years earlier, Shawn had been kidnapped and held captive. When the FBI suspected Shawn's kidnapper in the abduction of another boy, both boys were rescued. As details of Shawn's captivity became public, many people asked why Shawn hadn't tried to escape or call the police while his kidnapper was at work. As it turned out, the kidnapper had abused and terrorized Shawn for months. At one point, he tried to strangle Shawn. When Shawn pleaded for his life, the kidnapper made the boy promise that he would never try to escape. "There wasn't a day when I didn't think that he'd just kill me," Shawn later recalled. Why do people often "blame the victim" after crimes, accidents, or other tragedies?



AP Photo/Tom Gannam, File



JOEL SAGET/AFP/Getty Images

Explaining Misfortune: The Self-Serving Bias
Given the self-serving bias, are these Tour de France competitors likely to explain their accident by listing internal factors such as their own carelessness or recklessness? Or are they more likely to blame external factors, such as swerving to miss a spectator or catching a tire in a rut?

The Self-Serving Bias

Using Explanations That Meet Our Needs

If you've ever listened to other students react to their grades on an important exam, you've seen the **self-serving bias** in action. When students do well on a test, they tend to congratulate themselves and to attribute their success to how hard they studied, their intelligence, and so forth—all *internal* attributions. But when a student bombs a test, the *external* attributions fly left and right: "They were all trick questions!" "I couldn't concentrate because the guy behind me kept coughing" (Kruger & Gilovich, 2004).

In a wide range of situations, people tend to credit themselves for their success and to blame their failures on external circumstances (Krusemark & others, 2008; Mezulis & others, 2004). Psychologists explain the self-serving bias as resulting from an attempt to save face and protect self-esteem in the face of failure (Kurman, 2010; Kwan & others, 2008).

Although common in many societies, the self-serving bias is far from universal, as cross-cultural psychologists have discovered (see the Culture and Human Behavior box). The various attributional biases are summarized in Table 12.1.

CULTURE AND HUMAN BEHAVIOR

Explaining Failure and Murder: Culture and Attributional Biases

Although the self-serving bias is common in individualistic cultures such as Australia and the United States, it is far from universal. In many collectivistic cultures, an opposite attributional bias is often demonstrated (Mezulis & others, 2004; Uskul & Kitayama, 2011). Called the *self-effacing bias* or *modesty bias*, it involves blaming failure on internal, personal factors, while attributing success to external, situational factors.

For example, compared to American students, Japanese and Chinese students are more likely to attribute academic failure to personal factors, such as lack of effort, instead of situational factors (Dornbusch & others, 1996). Thus, a Japanese student who does poorly on an exam is likely to say, "I didn't study hard enough." When Japanese or Chinese students perform poorly in school, they are expected to study harder and longer than before (Stevenson & Stigler, 1992). In contrast, Japanese and Chinese students tend to attribute academic *success* to *situational factors*. For example, they might say, "The exam was very easy" or "There was very little competition this year" (Stevenson & others, 1986).

Psychologists Hazel Markus and Shinobu Kitayama (1991) believe that the self-effacing bias reflects the emphasis that interdependent cultures place on fitting in with other members of the group. As the Japanese proverb goes, "The nail that sticks up gets pounded down." In collectivistic cultures, self-esteem does not rest on doing better than others in the group. Rather, standing out from the group is likely to produce psychological discomfort and tension.

Cross-cultural differences are also evident with the fundamental attribution error. In general, members of collectivistic cultures are less likely to commit the fundamental attribution error than are members of individualistic cultures (Bond & Smith, 1996; Koenig & Dean, 2011). That is, collectivists are more likely to attribute the causes of another person's behavior to external, situational factors rather than to internal, personal factors—the exact *opposite* of the attributional bias that is demonstrated in individualistic cultures (Uskul & Kitayama, 2011).

To test this idea in a naturally occurring context, psychologists Michael Morris and Kaiping Peng (1994) compared articles reporting the same mass murders in Chinese-language and English-language newspapers. In one case, the murderer was a Chinese graduate student attending a U.S. university. In the other case, the murderer was a U.S. postal worker. Regardless of whether the murderer was American or Chinese, the news accounts were fundamentally different depending on whether the *reporter* was American or Chinese.

The American reporters were more likely to explain the killings by making personal, internal attributions. For example, American reporters emphasized the murderers' personality traits, such as the graduate student's "bad temper" and the postal worker's "history of being mentally unstable."

In contrast, the Chinese reporters emphasized situational factors, such as the fact that the postal worker had recently been fired from his job and the fact that the graduate student had failed to receive an academic award. The Chinese reporters also cited social pressures and problems in U.S. society to account for the actions of the killers.

Clearly, then, how we account for our successes and failures, as well as how we account for the actions of others, is yet another example of how human behavior is influenced by cultural conditioning.

Haughtiness invites ruin; humility receives benefits.

—Chinese Proverb

TABLE 12.1

Common Attributional Biases and Explanatory Patterns

Bias	Description
Fundamental attribution error	We tend to explain the behavior of other people by attributing their behavior to internal, personal characteristics, while underestimating or ignoring the effects of external, situational factors. Pattern is reversed when accounting for our own behavior.
Blaming the victim	We tend to blame the victims of misfortune for causing their own misfortune or for not taking steps to prevent or avoid it. Partly due to the *just-world hypothesis.*
Hindsight bias	After an event has occurred, we tend to overestimate the extent to which we could have foreseen or predicted the outcome.
Self-serving bias	We have a tendency to take credit for our successes by attributing them to internal, personal causes, along with a tendency to distance ourselves from our failures by attributing them to external, situational causes. Self-serving bias is more common in individualistic cultures.
Self-effacing (or modesty) bias	We tend to blame ourselves for our failures, attributing them to internal, personal causes, while downplaying our successes by attributing them to external, situational causes. Self-effacing bias is more common in collectivistic cultures.

Source: Based on Maslow (1970).

self-serving bias The tendency to attribute successful outcomes of one's own behavior to internal causes and unsuccessful outcomes to external, situational causes.

CONCEPT REVIEW 12.1

Person Perception and Attribution

Match each of the following concepts with one of the examples below.

a. fundamental attribution error
b. self-serving bias
c. self-effacing bias
d. implicit personality theory
e. social categorization

_____ 1. Dr. Nobuaki, a brilliant young professor who has just joined the faculty, was asked to give a talk about her research to her new colleagues. She began her presentation by saying, "I am very poorly prepared, and my research is not very important. Thank you for being patient with me."

_____ 2. When Fern saw the man sitting on the steps in San Francisco holding a cup, she thought he was a homeless person.

_____ 3. Your next-door neighbor is a shy, boring, and mild-mannered high school Latin teacher. When you sign up for a sky-diving class, you are astonished to discover that he is one of the instructors.

_____ 4. At the very beginning of the marathon, the top three female runners collided and were all forced to drop out because of their extensive injuries. Christine, the surprise winner of the marathon, told a local sports reporter that her win was due to her hard work, running technique, and self-discipline.

_____ 5. You're sitting in a nice restaurant looking over the menu. From behind you, you hear a loud crash as a tray full of dishes hits the floor. As you watch the waiter scrambling to clean up the mess, you think, "What a klutz!"

The Social Psychology of Attitudes

KEY THEME

› An attitude is a learned tendency to evaluate objects, people, or issues in a particular way.

KEY QUESTIONS

› What are the three components of an attitude?
› Under what conditions are attitudes most likely to determine behavior?
› What is cognitive dissonance?

Should high school graduation requirements include a class on basic sex education, birth control methods, and safe sex? Should there be a compulsory military or community service requirement for all young adults? Should there be national health care coverage for all U.S. citizens? Should affordable, high-quality day care centers be a national priority? Should affordable, high-quality elder care centers be a national priority?

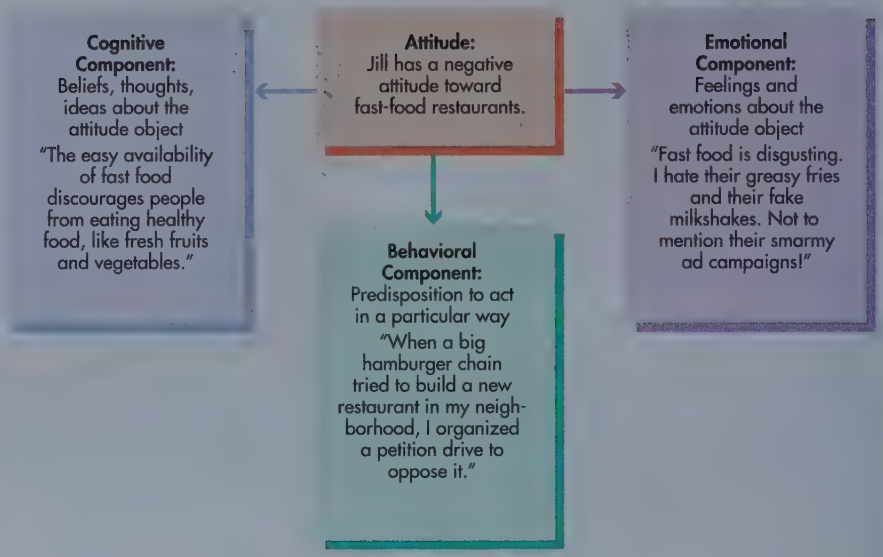


FIGURE 12.1 The Components of Attitudes
An attitude is a positive or negative evaluation of an object, person, or idea. An attitude may have cognitive, emotional, and behavioral components.

On these and many other subjects, you've probably formed an attitude. Psychologists formally define an **attitude** as a learned tendency to evaluate some object, person, or issue in a particular way (Banaji & Heiphetz, 2010; Bohner & Dickel, 2011). Attitudes are typically positive or negative, but they can also be *ambivalent,* as when you have mixed feelings about an issue, person, or group (Costarelli, 2011).

As shown in Figure 12.1, attitudes can include three components. First, an attitude may have a *cognitive component:* your thoughts and conclusions about a given topic or object. For example, one of our colleagues, Aaron, is a staunch environmentalist. On more than one occasion, Aaron has said, "In my opinion, cars and trucks need to be much more fuel-efficient so that we can reduce or eliminate air pollution in our cities." Second, an attitude may have an emotional or *affective component,* as when Aaron starts ranting about drivers he sees on the highway: "It makes me furious to see people driving those huge SUVs to work, especially when they don't even have passengers!" Finally, an attitude may have a *behavioral component,* in which attitudes are reflected in action. In Aaron's case, he bought a hybrid gasoline/electric car that gets 60 miles to the gallon, even in the city. Even so, he frequently rides his bicycle to campus rather than drive.

Along with forming attitudes toward objects, ideas, or political campaigns, we also form attitudes about people. The In Focus box, "Interpersonal Attraction and Liking," discusses some of the factors that affect the thoughts and feelings that we develop about other people.



AP Photo

Attitudes and Behavior These Egyptian protesters are calling for the ouster of then-President Hosni Mubarak. People who hold strong opinions and express them openly, like these protestors, are most likely to behave in ways that are consistent with with their attitudes.

The Effect of Attitudes on Behavior

Intuitively, you probably assume that your attitudes tend to guide your behavior. But social psychologists have consistently found that people don't always act in accordance with their attitudes. For example, you might disapprove of cheating, yet find yourself peeking at a classmate's exam paper when the opportunity presents itself. Or you might strongly favor a certain political candidate, yet not vote on election day.

When are your attitudes likely to influence or determine your behavior? Social psychologists have found that you're most likely to behave in accordance with your attitudes when:

- You anticipate a favorable outcome or response from others for behaving that way.
- Your attitudes are extreme or are frequently expressed (Ajzen, 2001).

- Your attitudes have been formed through direct experience (Fazio, 1990).
- You are very knowledgeable about the subject (Fabrigar & Wegener, 2010).
- You have a vested interest in the subject and personally stand to gain or lose something on a specific issue (Thornton & Tizard, 2010).

Clearly, your attitudes do influence your behavior in many instances. When you feel strongly about an issue, have a personal stake in the issue, and anticipate a positive outcome in a particular situation, your attitudes will influence your behavior. Now, consider the opposite question: Can your behavior influence your attitudes?

attitude A learned tendency to evaluate some object, person, or issue in a particular way; such evaluations may be positive, negative, or ambivalent.

IN FOCUS

Interpersonal Attraction and Liking

In psychology, *attraction* refers to feeling drawn to other people—having positive thoughts and feelings about them. Often, attraction motivates us to interact with or develop a relationship with the attractive person.

What makes one person more attractive than another? Personal characteristics such as warmth and trustworthiness, adventurousness, and social status influence judgments of attractiveness (Finkel & Baumeister, 2010; Sprecher & Felmlee, 2008). But physical appearance, especially facial features, is probably the most significant factor in attraction. Studies reveal that wide smiles, high eyebrows, dilated pupils, and full lips are judged as attractive by both men and women, and that these preferences are consistent across many cultures (Chatterjee, 2011; Perrett, 2010). However, the sexes do differ in some respects. For example, in online dating, women tend to prefer men who are taller than average, but men tend to prefer women who are of short or average height (Hitsch & others, 2010).



J.D.Heaton/age fotostock



Juice Images/Alamy



Maria Teijeiro/Getty Images



John Warburton-Lee/DanitaDelimont.com

Ideals of Beauty Around the World Large eyes, a wide smile, and full lips are attractive in cultures around the world. The beautiful smiles of a Hmong woman from Thailand, a young Hispanic-American man, a woman from Chile, and a man from the Omo Delta in East Africa would be considered attractive by any cultural standard.

Some aspects of attraction are *interpersonal*. For example, we are more attracted to people whom we perceive as being like us—in physical characteristics, personality traits, attitudes, and even psychological health (Finkel & Baumeister, 2010). Even young children find others who share their views on homework, books, and pets more attractive than those with dissimilar views (Singh & others, 2008). Although similarity is a powerful predictor of attraction in most western cultures, cross-cultural research has shown that it is less important in some eastern cultures, such as Japan (Heine & others, 2009).

Familiarity is another predictor of attraction and liking (Reis & others, 2011). In general, the more familiar a person is, the more we tend to like her. Why? One explanation is that *most* interactions with other people are relatively pleasant. So, unless a person is particularly obnoxious or *un*pleasant, frequent interactions lead to more feelings of mutual pleasure, understanding, and acceptance.

The situations in which we interact with people also affect attraction. When happy, intoxicated, or physically aroused by exercise or exertion, we are more likely to rate others as attractive (Finkel & Baumeister, 2010). And, if we anticipate that an attractive person is likely to be attracted to or like *us*, we're more likely to be attracted to him, to like him, and to behave warmly towards him (Stinson & others, 2009).

Finally, feelings of attraction can be influenced by the socioeconomic and cultural environment. For example, cross-cultural research has shown that men in societies where food and resources are in short supply tend to prefer heavier women (Tovée & others, 2006; Swami & Tovée, 2006). Conversely, a preference for thinner women is more common in societies where resources are abundant (Swami & others, 2010).

But is it culture or hunger that shapes a preference for heavier women? In a clever study, Leif Nelson and Evan Morrison (2005) compared the preferences of college students as they were entering and leaving a campus dining hall at dinnertime. The presumably hungry males *entering* the dining hall preferred heavier women than the satiated males *exiting* the dining hall. (Having an empty or full stomach didn't affect the female college students' ratings of an ideal body shape.) The moral of the story: culture affects body shape preference, but may do so through processes that are not culture-specific but rather situational.



Bernard Napthine/Lonely Planet Images

Fried Grasshoppers: Tasty or Disgusting? Most Americans do not rate fried grasshoppers as one of their favorite foods. Suppose you agreed to eat a handful of grasshoppers after being asked to do so by a rude, unfriendly experimenter. Do you think your attitude toward fried grasshoppers would improve more than that of a person who ate grasshoppers after being asked to do so by a friendly, polite experimenter? Why or why not?

The Effect of Behavior on Attitudes

Fried Grasshoppers for Lunch?!

Suppose you have volunteered to participate in a psychology experiment. At the lab, a friendly experimenter asks you to indicate your degree of preference for a variety of foods, including fried grasshoppers, which you rank pretty low on the list. During the experiment, the experimenter instructs you to eat some fried grasshoppers. You manage to swallow three of the crispy critters. At the end of the experiment, your attitudes toward grasshoppers as a food source are surveyed again.

Later in the day, you talk to a friend who also participated in the experiment. You mention how friendly and polite you thought the experimenter was. But your friend had a different experience. He thought the experimenter was an arrogant, rude jerk.

Here's the critical question: Whose attitude toward eating fried grasshoppers is more likely to change in a positive direction? Given that you interacted with a friendly experimenter, most people assume that *your* feelings about fried grasshoppers are more likely to have improved than your friend's attitude. In fact, it is your friend—who encountered the obnoxious experimenter—who is much more likely to hold a more positive attitude toward eating fried grasshoppers than you.

At first glance, this finding seems to go against the grain of common sense. So how can we explain this outcome? The fried grasshoppers story represents the basic design of a classic experiment by social psychologist **Philip Zimbardo** and his colleagues (1965). Zimbardo's experiment and other similar ones underscore the power of cognitive dissonance. **Cognitive dissonance** is an unpleasant state of psychological tension (*dissonance*) that occurs when there's an inconsistency between two thoughts or perceptions (*cognitions*). This state of dissonance is so unpleasant that we are strongly motivated to reduce it (Festinger, 1957, 1962).

Cognitive dissonance commonly occurs in situations in which you become uncomfortably aware that your behavior and your attitudes are in conflict. In these situations, you are simultaneously holding two conflicting cognitions: your original attitude versus the realization your behavior contradicts that attitude. If you can easily rationalize your behavior to make it consistent with your attitude, then any dissonance you might experience can be quickly and easily resolved. But when your behavior *cannot* be easily justified, how can you resolve the contradiction and eliminate the unpleasant state of dissonance? Since you can't go back and change the behavior, *you change your attitude to make it consistent with your behavior.*

Let's take another look at the results of the grasshopper study, this time from the perspective of cognitive dissonance theory. Your attitude toward eating grasshoppers did *not* change. Why? Because you could easily rationalize the conflict between your attitude ("Eating grasshoppers is disgusting") and your behavior (eating three grasshoppers). You probably justified your behavior by saying something like, "I ate the grasshoppers because the experimenter was such a nice guy and I wanted to help him out."

Social Psychologist Philip Zimbardo (b. 1933) Zimbardo grew up in an immigrant family in a poor neighborhood in the South Bronx, an experience that sensitized him to the power of situational influences and the destructive nature of stereotypes and prejudice (Zimbardo, 2005, 2007). Much of Zimbardo's research has investigated "the subtle but pervasive power of situations to influence human behavior." Zimbardo's research has ranged from attitude change to shyness, prison reform, and the psychology of evil. As Zimbardo (2000b) observes, "The joy of being a psychologist is that almost everything in life is psychology, or should be, or could be." Later in the chapter, we'll encounter Zimbardo's most famous—and controversial—research: the Stanford Prison Experiment.



Courtesy of Zimbardo Collection/©Nila Winter

However, your friend, who encountered the rude experimenter, can't use that rationalization to explain the contradiction between disliking grasshoppers and voluntarily eating them. Thus, he experiences an uncomfortable state of cognitive dissonance. Since he can't go back and change his behavior, he is left with the only part of the equation that can be changed—his attitude (see Figure 12.2). "You know, eating those grasshoppers wasn't *that* bad," your friend comments. "In fact, they were kind of crunchy." Notice how his change in attitude reduces the dissonance between his previous attitude and his behavior.

Attitude change due to cognitive dissonance is quite common in everyday life. For

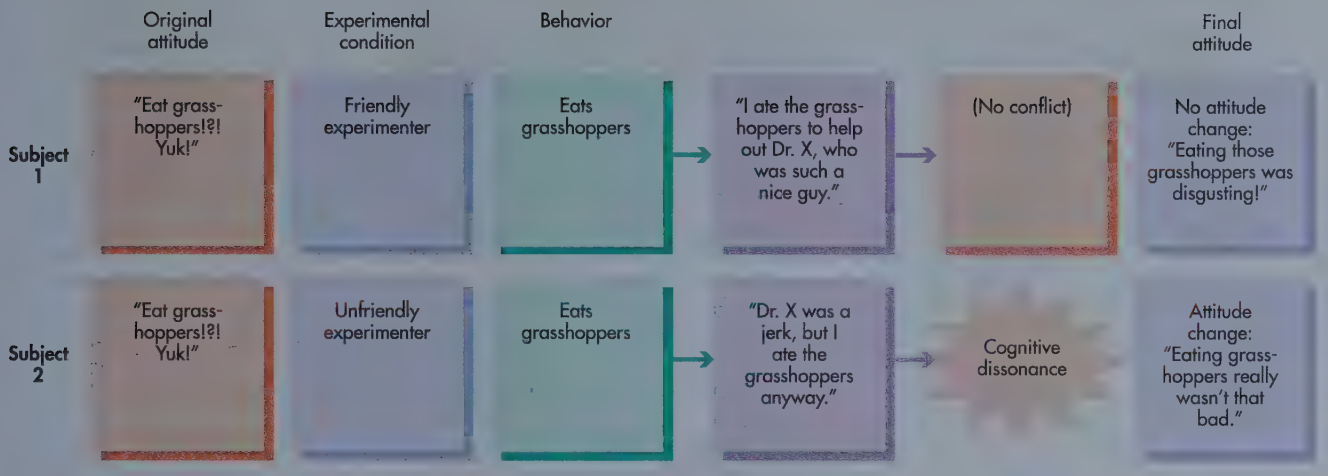


FIGURE 12.2 How Cognitive Dissonance Leads to Attitude Change When your behavior conflicts with your attitudes, an uncomfortable state of tension is produced. However, if you can rationalize or explain your behavior, the conflict (and the tension) is eliminated or avoided. If you *can't* explain your behavior, you may change your attitude so that it is in harmony with your behavior.

example, consider the person who impulsively buys a new leather coat that she really can't afford. "It was too good a bargain to pass up," she rationalizes.

Cognitive dissonance can also change the strength of an attitude to make it consistent with some behavior that has already been performed. For example, people tend to be much more favorably inclined toward a given political candidate *after* they have voted for him or her than just before (Beasley & Joslyn, 2001).

A similar example of cognitive dissonance in action involves choosing between two basically equal alternatives, especially if the decision is important and difficult to undo (Festinger, 1962; Stone & Fernandez, 2008). Suppose you had to choose between two colleges, two houses, or two cars. Each choice has desirable and undesirable features, creating dissonance. But once you actually make the choice, you immediately bring your attitudes more closely into line with your commitment, reducing cognitive dissonance. In other words, *after* you make the choice, you emphasize the negative features of the choice you've rejected, which is commonly called a "sour grapes" rationalization. You also emphasize the positive features of the choice to which you have committed yourself—a "sweet lemons" rationalization.

Understanding Prejudice

KEY THEME

› Prejudice refers to a negative attitude toward people who belong to a specific social group, while stereotypes are clusters of characteristics that are attributed to people who belong to specific social categories.

KEY QUESTIONS

› What is the function of stereotypes, and how do they relate to prejudice?

› What are in-groups, out-groups, and ethnocentrism, and how do they influence social judgments?

› What are implicit attitudes, and how are they measured?

In this section, you'll see how person perception, attribution, and attitudes come together in explaining **prejudice**—a negative attitude toward people who belong to a specific social group.

Prejudice is ultimately based on the exaggerated notion that members of other social groups are very different from members of our own social group. So as you read this discussion, it's important for you to keep two well-established points in mind. First, *racial and ethnic groups are far more alike than they are different* (Mallett & Wilson, 2010; Wagner & others, 2011). And second, any differences that may exist *between* members of different racial and ethnic groups are far smaller than differences *among* various members of the same group (Bodenhausen & Richeson, 2010).

cognitive dissonance An unpleasant state of psychological tension or arousal *(dissonance)* that occurs when two thoughts or perceptions *(cognitions)* are inconsistent; typically results from the awareness that attitudes and behavior are in conflict.

prejudice A negative attitude toward people who belong to a specific social group.

From Stereotypes to Prejudice: In-Groups and Out-Groups

As we noted earlier, using social categories to organize information about other people seems to be a natural cognitive tendency. Many social categories can be defined by relatively objective characteristics, such as age, language, religion, and skin color. A specific kind of social category is a **stereotype**—a cluster of characteristics that are attributed to members of a specific social group or category. Stereotypes are based on the assumption that people have certain characteristics *because* of their membership in a particular group.

Stereotypes typically include qualities that are unrelated to the objective criteria that define a given category (Crawford & others, 2011). For example, we can objectively sort people into different categories by age. But our stereotypes for different age groups may include qualities that have little or nothing to do with "number of years since birth." Associations of "impulsive and irresponsible" with teenagers, "forgetful and incompetent" with elderly people, and "boring and conservative" with middle-aged adults are examples of associating unrelated qualities with age groups—that is, stereotyping.

Like our use of other social categories, our tendency to stereotype social groups seems to be a natural cognitive process. Stereotypes simplify social information so that we can sort out, process, and remember information about other people more easily (Bodenhausen & Richeson, 2010). But like other mental shortcuts we've discussed in this chapter, relying on stereotypes can cause problems. Attributing a stereotypic cause for an outcome or event can blind us to the true causes of events (Johnston & Miles, 2007). For example, a parent who assumes that a girl's poor computer skills are due to her gender rather than a lack of instruction might never encourage her to overcome her problem.

Research by psychologist Claude Steele (1997, 2003, 2011) has demonstrated another detrimental effect of stereotypes, particularly derogatory stereotypes, which he calls *stereotype threat*. As we discussed in Chapter 7, simply being aware that your social group is associated with a particular stereotype can negatively impact your performance on tests or tasks that measure abilities that are thought to be associated with that stereotype (Schmader, 2010). For example, even mathematically gifted women tend to score lower on difficult math tests when told that the test tended to produce gender differences than when told that such tests did not produce gender differences (Forbes & Schmader, 2010; Rydell & others, 2010).

Once they are formed, stereotypes are hard to shake. One reason for this is that stereotypes are not always completely false. Sometimes they have a kernel of truth, making them easy to confirm, especially when you see only what you expect to see. Even so, there's a vast difference between a kernel and the cornfield. When stereotypic beliefs become expectations that are applied to *all* members of a given group, stereotypes can be both misleading and damaging (Dovidio & Gaertner, 2010).

Consider the stereotype that men are more assertive than women and that women are more nurturant than men. This stereotype does have evidence to support it, but only in terms of the *average* difference between men and women (Wood & Eagly, 2010). Thus, it would be inappropriate to automatically apply this stereotype to every individual man and woman. Doing so would be an example of prejudice.

Equally important, when confronted by evidence that contradicts a stereotype, people tend to discount that information in a variety of ways (Phelan & Rudman, 2010; Rudman & Fairchild, 2004). For example, suppose you are firmly convinced that all "Zeegs" are dishonest, sly, and untrustworthy. One day you absent-mindedly leave your wallet on a store's checkout counter. As you walk into the parking lot, you hear a voice calling, "Hey, you forgot your wallet!" It's a Zeeg running after you and waving your wallet in the air. "I was behind you in line and thought you might need this," the Zeeg smiles, handing you your wallet.

Will this experience change your stereotype of Zeegs as dishonest, sly, and untrustworthy? Probably not. It's more likely that you'll conclude that this individual Zeeg



AP Photo/The Albuquerque Journal, Roberto E. Rosales

The Power of Stereotypes
American movies have made the image of the cowboy almost universally recognizable. What kinds of qualities are associated with the stereotype of the cowboy? How might that stereotype be an inaccurate portrayal of a person working on a cattle ranch today?

is an *exception* to the stereotype. If you run into more than one honest Zeeg, you may create a mental subgroup for individuals who belong to the larger group but depart from the stereotype in some way (Sherman & others, 2005; Queller & Mason, 2008). By creating a subcategory of "honest, hardworking Zeegs," you can still maintain your more general stereotype of Zeegs as dishonest, sly, and untrustworthy.

Creating exceptions allows people to maintain stereotypes in the face of contradictory evidence. Typical of this exception-that-proves-the-rule approach is the person who says, "Hey, I'm not prejudiced! In fact, I've got a couple of good friends who are Zeegs."

Stereotypes are closely related to another tendency in person perception. People have a strong tendency to perceive others in terms of two very basic social categories: "us" and "them." More precisely, the **in-group** ("us") refers to the group or groups to which we belong, and **out-group** ("them") refers to groups of which we are not a member. In-groups and out-groups aren't necessarily limited to racial, ethnic, or religious boundaries. Virtually any characteristic can be used to make in-group and out-group distinctions: Mac versus PC users, Cubs versus White Sox fans, Northsiders versus Southsiders, math majors versus English majors, and so forth.



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"The first six are for bullets. This one's for lip balm."

The Out-Group Homogeneity Effect

They're All the Same to Me

Two important patterns characterize our views of in-groups versus out-groups. First, when we describe the members of our *in-group,* we typically see them as being quite varied, despite having enough features in common to belong to the same group. In other words, we notice the diversity within our own group.

Second, we tend to see members of the *out-group* as much more similar to one another, even in areas that have little to do with the criteria for group membership. This tendency is called the **out-group homogeneity effect.** (The word *homogeneity* means "similarity" or "uniformity.")

For example, what qualities do you associate with the category of "engineering major"? If you're *not* an engineering major, you're likely to see engineering majors as a rather similar crew: male, logical, analytical, conservative, and so forth. However, if you *are* an engineering major, you're much more likely to see your in-group as quite *heterogeneous,* or varied (Dovidio & Gaertner, 2010). You might even come up with several subgroups, such as studious engineering majors versus party-animal engineering majors, and electrical engineering majors versus chemical engineering majors.

In-Group Bias

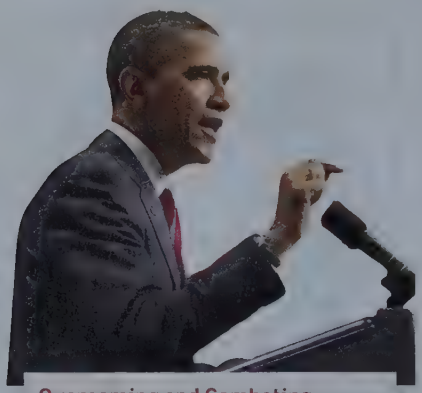
We're Tactful—*They're* Sneaky

In-group bias is our tendency to make favorable, positive attributions for behaviors by members of our in-group and unfavorable, negative attributions for behaviors by members of out-groups. We succeeded because we worked hard; they succeeded because they lucked out. We failed because of circumstances beyond our control; they failed because they're stupid and incompetent. We're thrifty; they're stingy. And so on.

One form of in-group bias is called **ethnocentrism**—the belief that one's culture or ethnic group is superior to others. You're engaging in ethnocentrism when you use your culture or ethnic group as the yardstick by which you judge other cultures or ethnic groups. Not surprisingly, ethnocentric thinking contributes to the formation of negative stereotypes about other cultures whose customs differ from our own.

In combination, stereotypes and in-group/out-group bias form the *cognitive* basis for prejudicial attitudes. But, as with many attitudes, prejudice also has a strong *emotional* component (Jackson, 2011). In the case of prejudice, the emotions are intensely negative—hatred, contempt, fear, loathing. *Behaviorally,* prejudice can be displayed in some form of *discrimination*—behaviors ranging from privately sneering at to physically attacking members of an out-group (Dovidio & Gaertner, 2010).

- **stereotype** A cluster of characteristics that are associated with all members of a specific social group, often including qualities that are unrelated to the objective criteria that define the group.
- **in-group** A social group to which one belongs.
- **out-group** A social group to which one does not belong.
- **out-group homogeneity effect** The tendency to see members of out-groups as very similar to one another.
- **in-group bias** The tendency to judge the behavior of in-group members favorably and out-group members unfavorably.
- **ethnocentrism** The belief that one's own culture or ethnic group is superior to all others and the related tendency to use one's own culture as a standard by which to judge other cultures.



Overcoming and Combating Prejudice The self-described "son of a black man from Kenya and a white woman from Kansas," Barack Obama seemed an unlikely presidential candidate. Obama's ability to build a political coalition among people of different racial, ethnic, economic, and age groups led to his winning the White House. In a speech on racial politics in the United States, Obama declared, "I believe deeply that we cannot solve the challenges of our time unless we solve them together—unless we perfect our union by understanding that we may have different stories, but we hold common hopes; that we may not look the same and we may not have come from the same place, but we all want to move in the same direction—towards a better future for our children and our grandchildren."

JIM WATSON/AFP/Getty Images

How can we account for the extreme emotions that often characterize prejudice against out-group members? One theory holds that prejudice and intergroup hostility increase when different groups are competing for scarce resources, whether jobs, acreage, oil, water, or political power (see Pratto & Glasford, 2008). Prejudice and intergroup hostility are also likely to increase during times of social change (Brewer, 1994; Staub, 1996).

However, prejudice often exists in the absence of direct competition for resources, changing social conditions, or even contact with members of a particular out-group. What accounts for prejudice in such situations? Research by psychologist Victoria Esses and her colleagues (1993, 2005) has demonstrated that people are often prejudiced against groups that are perceived as threatening important in-group norms and values. For example, a person might be extremely prejudiced against gays and lesbians because he feels that they threaten his in-group's cherished values, such as a strong commitment to traditional sex roles and family structure.

Implicit Attitudes

Most people today agree that prejudice and, especially, racism are wrong. Blatant displays of racist, sexist, or homophobic speech or behavior are no longer socially acceptable. However, some psychologists now believe that overt forms of prejudice have been replaced by more subtle forms of prejudice (Hewstone & others, 2002; Sritharan & Gawronski, 2010).

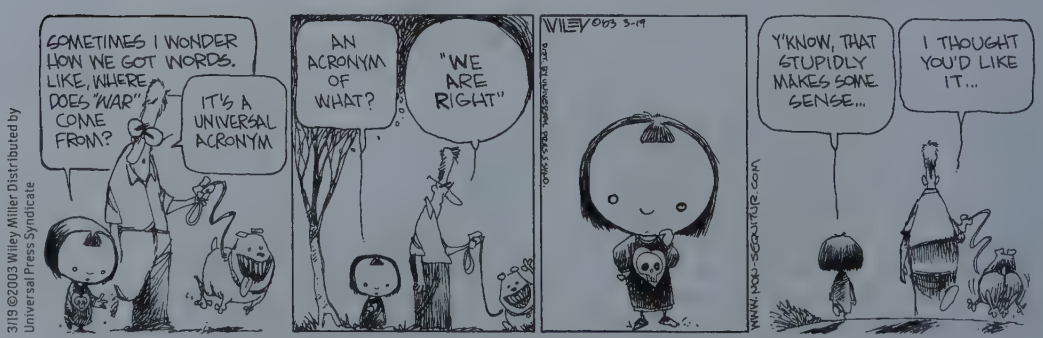
Sometimes people who are not *consciously* prejudiced against particular groups nevertheless respond in prejudiced ways (Plant & Devine, 2009). For example, a man who consciously strives to be nonsexist may be reluctant to consult a female surgeon or may feel uncomfortable when he boards an international flight and discovers that both the pilot and co-pilot are female. Such biased responses can sometimes affect behavior in ways that we neither intend nor realize (Devine, 2001; Stanley & others, 2011).

How can such responses be explained? In contrast to *explicit* attitudes, of which you are consciously aware, **implicit attitudes** are evaluations that are automatic, unintentional, and difficult to control (Bohner & Dickel, 2011). They are sometimes, but not always, unconscious (Sritharan & Gawronski, 2010).

Our implicit attitudes often differ from our explicit attitudes, especially when social and cultural norms prohibit negative attitudes regarding race, gender, or sexual orientation (Bodenhausen & Richeson, 2010). It may appear that some people are hiding their true views on a subject, but often they themselves are unaware of their negative attitudes or prejudices (Banaji & Heiphetz, 2010).

If people won't admit or aren't consciously aware of implicit attitudes, how can they be detected and measured? The most widely used test to measure implicit attitudes and preferences is the *Implicit Association Test* or *IAT*, developed by psychologist Anthony Greenwald and his colleagues (1998).

The IAT is a computer-based test that measures the degree to which you associate particular groups of people with specific characteristics or attributes. The IAT is based on the assumption that people can sort images and words more easily when



concepts seem to "match" or go together. So, for example, the Age IAT measures the speed with which you classify pairings of "good" or "bad" words with photographs of people of different ages. Similarly, the Race-Weapons IAT measures the degree to which participants associate photographs of black or white faces with weapons (like a gun or a sword) or harmless objects (a camera or water bottle).

Other IATs measure implicit attitudes toward sexual orientation, weight, disability, and racial and ethnic groups. IATs have also been developed to measure the strength of stereotyped associations, such as the strength of associations between gender and career or family. You can try the IAT yourself online at: https://implicit.harvard.edu/

The IAT has been completed by over 10 million people around the world (Banaji & Heiphetz, 2010). The results suggest that implicit preferences are quite pervasive. As Brian Nosek and his colleagues (2007) concluded, "With few exceptions, across domains and demographic categories, participants showed implicit and explicit social preferences and stereotypes. Men and women, young and old, conservative and liberal, Black, White, Asian, and Hispanic—all groups have social preferences for some groups over others, and hold stereotypic associations or beliefs. Social preferences are not possessed exclusively by a privileged few—they are a general characteristic of human social cognition."

Although in wide use, the IAT is controversial (see Amodio & Mendoza, 2010; Azar, 2008). For example, some researchers argue that the ease with which certain associations are made may reflect familiarity with cultural stereotypes, rather than personal bias or prejudice (Blanton & others, 2009). And, the degree to which *implicit* attitudes affect *actual* behavior is still an open question, although some studies suggest that they do (see Greenwald & others, 2009; Stanley & others, 2011).

Despite controversies about the IAT, psychologists agree that becoming *aware* of our biased attitudes, whether implicit or explicit, is the first step toward overcoming them (Paluck & Green, 2009). We turn to that topic in the next section.

implicit attitudes Preferences and biases toward particular groups that are automatic, spontaneous, unintentional, and often unconscious; measured with the *Implicit Associations Test* (IAT).

Overcoming Prejudice

KEY THEME

› Prejudice can be overcome when rival groups cooperate to achieve a common goal.

KEY QUESTIONS

› How has this finding been applied in the educational system?

› What other conditions are essential to reducing tension between groups?

How can prejudice be combated? A classic series of studies headed by psychologist **Muzafer Sherif** helped clarify the conditions that produce intergroup conflict *and* harmony. Sherif and his colleagues (1961) studied a group of 11-year-old boys in an unlikely setting for a scientific experiment: a summer camp located at Robbers Cave State Park in Oklahoma.

The Robbers Cave Experiment

Pretending to be camp counselors and staff, the researchers observed the boys' behavior under carefully orchestrated conditions. The boys were randomly assigned to two groups. The groups arrived at camp in separate buses and were headquartered in different areas of the camp. One group of boys dubbed themselves the Eagles, the other the Rattlers. After a week of separation, the researchers arranged for the groups to meet in a series of competitive games. A fierce rivalry quickly developed, demonstrating the ease with which mutually hostile groups could be created.



Creating Conflict Between Groups Psychologist Muzafer Sherif and his colleagues demonstrated how easily hostility and distrust could be created between two groups. Competitive situations, like this tug-of-war, increased tension between the Rattlers and the Eagles.

From Sherif, Muzafer; Harvey, O. J.; White, B. Jack; Hood, William R.; & Sherif, Carolyn W. (1961/1988). *The Robbers Cave Experiment: Intergroup Conflict and Cooperation*. Middletown, CT: Wesleyan University Press.



From Sherif, Muzafer; Harvey, O.J.; White, B. Jack; Hood, William R.; & Sherif, Carolyn W. (1961/1988). *The Robbers Cave Experiment: Intergroup Conflict and Cooperation*. Middletown, CT: Wesleyan University Press.

Overcoming Group Conflict To decrease hostility between the Rattlers and the Eagles at Robbers Cave, the researchers created situations that required the joint efforts of both groups to achieve a common goal, such as fixing the water supply. These cooperative tasks helped the boys recognize their common interests and become friends.

The rivalry became increasingly bitter. The Eagles burned the Rattlers' flag. In response, the Rattlers trashed the Eagles' cabin. Somewhat alarmed, the researchers tried to diminish the hostility by bringing the two groups together under peaceful circumstances and on an equal basis—having them go to the movies together, eat in the same dining hall, and so forth. But contact alone did not mitigate the hostility. If anything, these situations only served as opportunities for the rival groups to berate and attack each other. For example, when the Rattlers and Eagles ate together in the same dining hall, a massive food fight erupted!

How could harmony between the groups be established? Sherif and his fellow researchers created a series of situations in which the two groups would need to *cooperate to achieve a common goal.* For example, the researchers secretly sabotaged the water supply. Working together, the Eagles and the Rattlers managed to fix it. On another occasion, the researchers sabotaged a truck that was to bring food to the campers. The hungry campers overcame their differences to join forces and restart the truck. After a series of such joint efforts, the rivalry diminished and the groups became good friends (Sherif, 1956; Sherif & others, 1961).

Sherif successfully demonstrated how hostility between groups could be created and, more important, how that hostility could be overcome. However, other researchers questioned whether these results would apply to other intergroup situations. After all, these boys were very homogeneous: white, middle class, Protestant, and carefully selected for being healthy and well-adjusted (Fiske & Ruscher, 1993; Sherif, 1966). In other words, there were no *intrinsic* differences between the Rattlers and the Eagles; there was only the artificial distinction created by the researchers.

The Jigsaw Classroom

Promoting Cooperation

Social psychologist Elliot Aronson (1990, 1992) tried adapting the results of the Robbers Cave experiments to a very different group situation—a newly integrated elementary school. Realizing that mere contact between black and white children was not dissipating tension and prejudice, Aronson reasoned that perhaps the competitive schoolroom atmosphere was partly at fault. Perhaps tension between racial groups might decrease if cooperation replaced competition.

Aronson and his colleagues tried a teaching technique that stressed cooperative, rather than competitive, learning situations (see Aronson, 1990; Aronson & Bridgeman, 1979). Dubbed the *jigsaw classroom technique,* this approach brought together students in small, ethnically diverse groups to work on a mutual project. Like the pieces of a jigsaw puzzle, each student had a unique contribution to make toward the success of the group. Each student became an expert on one aspect of the overall project and had to teach it to the other members of the group. Thus, interdependence and cooperation replaced competition.

The results? Children in the jigsaw classrooms benefited. They had higher self-esteem and a greater liking for children in other ethnic groups than did children in traditional classrooms. They also demonstrated a lessening of negative stereotypes and prejudice, and a reduction in intergroup hostility (see Aronson, 1987, 1995; Aronson & Bridgeman, 1979). As Aronson (1999) points out, "Cooperation changes our tendency to categorize the out-group from 'those people' to 'us people.'"

conformity Adjusting your opinions, judgments, or behavior so that it matches the opinions, judgments, or behavior of other people, or the norms of a social group or situation.

CONCEPT REVIEW 12.2

The Psychology of Attitudes and Prejudice

Which of the following concepts is being illustrated in each of the examples below: cognitive dissonance, stereotyping, in-group bias, ethnocentrism, out-group homogeneity?

1. Henry's classmate in college was from Sardinia, and he loved to eat sardines for lunch. Henry now believes that the diet of all Sardinians is centered on sardines, and he has little doubt about why the island is called Sardinia. _____
2. A group of employees in the marketing department went out to lunch. They started to complain about the people who worked in accounting. One of them said, "Oh, well, you know those number crunchers are all alike. They just aren't very creative." _____
3. A group of students from Northern State College was watching the antics of a group of students from Western State College at a football game. "Look at how rowdy those guys are. That's disgusting!" one Northern State student observed. A half-hour later, the same student said, "I love going to our football games because everybody's so friendly and laid back. We really know how to let loose and have a good time." _____
4. Georgia thinks that track is a great all-around sport and desperately wants to make the track team. For the first few weeks, she trains hard every day. Gradually, however, she starts missing practice sessions, and on the day of the tryouts she oversleeps, performs poorly, and gets cut in the first round. Georgia says, "Track is so-o-o boring. I'd much rather be on the softball team." _____
5. In an introductory anthropology class, students begin to groan and laugh as they watch a film showing members of a remote tribe eating head lice, grubs, and iguanas. "How repulsive," remarked one gum-chewing student. "Those poor savages are really ignorant and uncivilized," another student agreed, as he put a pinch of chewing tobacco in his mouth. _____

Conformity

Following the Crowd

KEY THEME

› Social influence involves the study of how behavior is influenced by other people and by the social environment.

KEY QUESTIONS

› What factors influence the degree to which people will conform?

› Why do people conform?

› How does culture affect conformity?

As we noted earlier, *social influence* is the psychological study of how our behavior is influenced by the social environment and other people. For example, if you typically contribute to class discussions, you've probably felt the power of social influence in classes where nobody else said a word (Stowell & others, 2010). No doubt you found yourself feeling at least slightly uncomfortable every time you ventured a comment or question.

If you changed your behavior to mesh with that of your classmates, you demonstrated conformity. **Conformity** occurs when you adjust your opinions, judgment, or behavior so that it matches other people, or the norms of a social group or situation (Hogg, 2010).

There's no question that all of us conform to group or situational norms to some degree. The more critical issue is *how far* we'll go to adjust our perceptions and opinions so that they're in sync with the majority opinion—an issue that intrigued social psychologist **Solomon Asch.** Asch (1951) posed a straightforward question: Would people still conform to the group if the group opinion was clearly wrong?

To study this question experimentally, Asch (1955) chose a simple, objective task with an obvious answer (Figure 12.3 on the next page). A group of people sat at a table and looked at a series of cards. On one side of each card was a standard line. On the other side were three comparison lines. All each person had to do was publicly indicate which comparison line was the same length as the standard line.



Life in society requires consensus as an indispensable condition. But consensus, to be productive, requires that each individual contribute independently out of his experience and insight. When consensus comes under the dominance of conformity, the social process is polluted and the individual at the same time surrenders the powers on which his functioning as a feeling and thinking being depends.

—Solomon Asch (1955)

Courtesy of The Solomon Asch Center for Study of Ethnopolitical Conflict

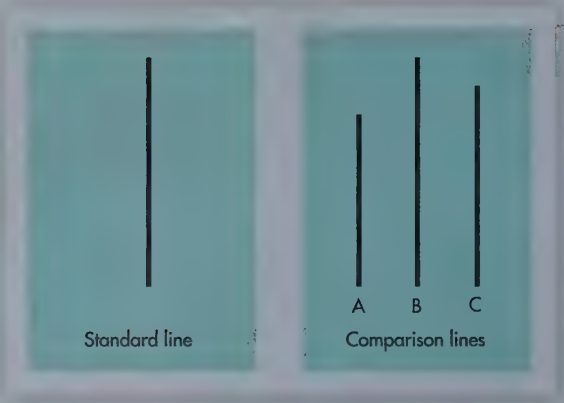


FIGURE 12.3 The Line Judgment Task Used in the Asch Conformity Studies In Asch's classic studies on conformity, subjects were asked to pick the comparison line that matched the standard line.

Source: Asch (1957).

Asch's experiment had a hidden catch. All the people sitting around the table were actually in cahoots with the experimenter, except for one—the real subject. Had you been the real subject in Asch's (1956) experiment, here's what you would have experienced. The first card is shown, and the five people ahead of you respond, one at a time, with the obvious answer: "Line B." Now it's your turn, and you respond the same. The second card is put up. Again, the answer is obvious and the group is unanimous. So far, so good.

Then the third card is shown, and the correct answer is just as obvious: Line C. But the first person confidently says, "Line A." And so does everyone else, one by one. Now it's your turn. To you it's clear that the correct answer is Line C. But the five people ahead of you have already publicly chosen Line A. How do you respond? You hesitate. Do you go with the flow or with what you know?

The real subject was faced with the uncomfortable situation of disagreeing with a unanimous majority on 12 of 18 trials in Asch's experiment. Notice, there was no direct pressure to conform—just the implicit, unspoken pressure of answering differently from the rest of the group.

Over one hundred subjects experienced Asch's experimental dilemma. Not surprisingly, participants differed in their degree of conformity. Nonetheless, the majority of Asch's subjects (76 percent) conformed with the group judgment on at least one of the critical trials. When the data for all subjects were combined, the subjects followed the majority and gave the wrong answer on *37 percent* of the critical trials (Asch, 1955, 1957). In comparison, a control group of subjects who responded alone instead of in a group accurately chose the matching line 99 percent of the time.

Although the majority opinion clearly exerted a strong influence, it's also important to stress the flip side of Asch's results. On almost two-thirds of the trials in which the majority named the wrong line, the subjects stuck to their guns and gave the correct answer, despite being in the minority (see Friend & others, 1990; Hodges & Geyer, 2006).

Adolescents and Conformity
Conformity to group norms peaks in early adolescence, as the similar hairstyles and clothing of these friends show. Think back to your own adolescence. Do you remember how important it was to you to fit in with other adolescents, especially those in your peer group?



Reuters/Lucy Nicholson

Factors Influencing Conformity

The basic model of Asch's classic experiment has been used in hundreds of studies exploring the dynamics of conformity (Bond, 2005; Hoffman & others, 2001). Why do we sometimes find ourselves conforming to the larger group? There are two basic reasons.

First is our desire to be liked and accepted by the group, which is referred to as **normative social influence.** If you've ever been ridiculed and rejected for going against the grain of a unanimous group, you've had firsthand experience with the pressure of normative social influence. Second is our desire to be right. When we're uncertain or doubt our own judgment, we may look to the group as a source of accurate information, which is called **informational social influence** (Turner, 2010).

Asch and other researchers identified several conditions that promote conformity, which are summarized in Table 12.2. But Asch also discovered that conformity *decreased* under certain circumstances. For example, having an ally seemed to counteract the social influence of the majority. Subjects were more likely to go against the majority view if just one other participant did so. Other researchers have found that any dissent increases resistance to the majority opinion, even if the other person's dissenting opinion is wrong (Allen & Levine, 1969; Packer, 2008b). Conformity also lessens even if the other dissenter's competence is questionable, as in the case of a dissenter who wore thick glasses and complained that he could not see the lines very well (Allen & Levine, 1971; Turner, 2010).

TABLE 12.2

Factors That Promote Conformity

You're more likely to conform to group norms when:

- You are facing a unanimous group of at least four or five people
- You must give your response in front of the group
- You have not already expressed commitment to a different idea or opinion
- You find the task to be ambiguous or difficult
- You doubt your abilities or knowledge in the situation
- You are strongly attracted to a group and want to be a member of it

Sources: Asch (1955); Campbell & Fairey (1989); Deutsch & Gerard (1955); Gerard & others (1968); Tanford & Penrod (1984).

normative social influence Behavior that is motivated by the desire to gain social acceptance and approval.

informational social influence Behavior that is motivated by the desire to be correct.

obedience The performance of a behavior in response to a direct command.

Culture and Conformity

Do patterns of conformity differ in other cultures? British psychologists Rod Bond and Peter Smith (1996) found in a wide-ranging meta-analysis that conformity is generally higher in collectivistic cultures than in individualistic cultures. Because individualistic cultures tend to emphasize independence, self-expression, and standing out from the crowd, the whole notion of conformity tends to carry a negative connotation.

In collectivistic cultures, however, publicly conforming while privately disagreeing tends to be regarded as socially appropriate tact or sensitivity. Publicly challenging the judgments of others, particularly the judgment of members of one's in-group, would be considered rude, tactless, and insensitive to the feelings of others. Thus, conformity in collectivistic cultures does not seem to carry the same negative connotation that it does in individualistic cultures.

Obedience

Just Following Orders

KEY THEME

› Stanley Milgram conducted a series of controversial studies on obedience, which is behavior performed in direct response to the orders of an authority.

KEY QUESTIONS

› What were the results of Milgram's original obedience experiments?

› What experimental factors were shown to increase the level of obedience?

› What experimental factors were shown to decrease the level of obedience?

Stanley Milgram was one of the most creative and influential researchers that social psychology has known (Blass, 2004, 2009; A. G. Miller, 2009). Sadly, Milgram died of a heart attack at the age of 51. Though Milgram made many contributions to social psychology, he is best known for his experimental investigations of obedience. **Obedience** is the performance of a behavior in response to a direct command. Typically, an authority figure or a person of higher status, such as a teacher or supervisor, gives the command.

Milgram was intrigued by Asch's discovery of how easily people could be swayed by group pressure. But Milgram wanted to investigate behavior that had greater personal significance than simply judging line lengths on a card (Milgram, 1963). Thus, Milgram posed what he saw as the most critical question: Could a person be pressured by others into committing an immoral act, some action that violated his or her own conscience, such as hurting a stranger? In his efforts to answer that question, Milgram embarked on one of the most systematic and controversial investigations in the history of psychology: to determine how and why people obey the destructive dictates of an authority figure (Blass, 2009; Russell, 2011).



Social Psychologist Stanley Milgram (1933–1984) Milgram is best known for his obedience studies, but his creative research skills went far beyond the topic of obedience. To study the power of social norms, for example, Milgram sent his students out into New York City to intrude into waiting lines or ask subway passengers to give up their seats. Milgram often capitalized on the "texture of everyday life" to "examine the way in which the social world impinges on individual action and experience" (Milgram, 1974a).

Courtesy of CUNY Graduate School and University Center

The individual who is commanded by a legitimate authority ordinarily obeys. Obedience comes easily and often. It is a ubiquitous and indispensable feature of social life.

–Stanley Milgram (1963)

Milgram's Original Obedience Experiment

Milgram was only 28 years old and a new faculty member at Yale University when he conducted his first obedience experiments. He recruited participants through direct-mail solicitations and ads in the local paper. Milgram's subjects represented a wide range of occupational and educational backgrounds. Postal workers, high school teachers, white-collar workers, engineers, and laborers participated in the study.

Outwardly, it appeared that two subjects showed up at Yale University to participate in the psychology experiment, but the second subject was actually an accomplice working with Milgram. The role of the experimenter, complete with white lab coat, was played by a high school biology teacher. When both subjects arrived, the experimenter greeted them and gave them a plausible explanation of the study's purpose: to examine the effects of punishment on learning.

Both subjects drew slips of paper to determine who would be the "teacher" and who the "learner." However, the drawing was rigged so that the real subject was always the teacher and the accomplice was always the learner. The learner was actually a mild-mannered, 47-year-old accountant who had been carefully rehearsed for his part in the drama. Assigned to the role of the teacher, the real subject would be responsible for "punishing" the learner's mistakes by administering electric shocks.

Immediately after the drawing, the teacher and learner were taken to another room, where the learner was strapped into an "electric chair." The teacher was then taken to a different room, from which he could hear but not see the learner. Speaking into a microphone, the teacher tested the learner on a simple word-pair memory task. In the other room, the learner pressed one of four switches to indicate with which alternative the word had previously been paired. The learner's response was registered in an answer box positioned on top of the "shock generator" in front of the teacher. Each time the learner answered incorrectly, the teacher was to deliver an electric shock.

Just in case there was any lingering doubt in the teacher's mind about the legitimacy of the shock generator, the *teacher* was given a sample jolt using the switch marked 45 volts. In fact, this sample shock was the only real shock given during the course of the staged experiment.

The first time the learner answered incorrectly, the teacher was to deliver an electric shock at the 15-volt level. With each subsequent error, the teacher was told to progress to the next level on the shock generator. The teacher was also told to announce the voltage level to the learner before delivering the shock.

At predetermined voltage levels, the learner vocalized first his discomfort, then his pain, and, finally, agonized screams. Some of the learner's vocalizations at the different voltage levels are shown in Table 12.3. After 330 volts, the learner's script

The "Electric Chair" With the help of the real subject, who had been assigned to the role of "teacher," the experimenter straps the "learner" into the electric chair. Unbeknownst to the real subject, the learner was actually a 47-year-old accountant who had been carefully rehearsed for his part in the experimental deception. The experimenter told both subjects, "Although the shocks can be extremely painful, they cause no permanent tissue damage."



From the film *Obedience*, distributed by the New York University Film Library

TABLE 12.3

The Learner's Schedule of Protests in Milgram's Obedience Experiment

120 volts → Ugh! Hey, *this* really hurts.

150 volts → Ugh!!! Experimenter! That's all. Get me out of here. I told you I had heart trouble. My heart's starting to bother me now. Get me out of here, please. My heart's starting to bother me. I refuse to go on. Let me out.

210 volts → Ugh!! Experimenter! Get me out of here. I've had enough. I *won't* be in the experiment any more.

270 volts → (*Agonized scream.*) Let me out of here. Let me out of here. Let me out of here. Let me out. Do you hear? Let me out of here.

300 volts → (*Agonized scream.*) I absolutely refuse to answer any more. Get me out of here. You can't hold me here. Get me out. Get me out of here.

315 volts → (*Intensely agonized scream.*) I told you I refuse to answer. I'm no longer part of this experiment.

330 volts → (*Intense and prolonged agonized scream.*) Let me out of here. Let me out of here. My heart's bothering me. Let me out, I tell you. (*Hysterically*) Let me out of here. Let me out of here. You have no right to hold me here. Let me out! Let me out! Let me out! Let me out of here! Let me out! Let me out!

This table shows examples of the learner's protests at different voltage levels. If the teacher administered shocks beyond the 330-volt level, the learner's agonized screams were replaced with an ominous silence. Source: Milgram (1974a).



Courtesy of Alexandra Milgram

Milgram's "Shock Generator" Machine A young Stanley Milgram sits next to his "shock generator." Milgram went to great lengths to make the shock generator look as authentic as possible. The front panel of the bogus shock generator had been engraved by professional industrial engravers. Whenever the teacher pressed a shock switch, the red light above the switch went on, a buzzing and clicking sound was heard, and the needle on the voltage meter swung to the right. Very convincing details. Do you think you would have been fooled into believing that this was a real shock generator?

called for him to fall silent. If the teacher protested that he wished to stop or that he was worried about the learner's safety, the experimenter would say, "The experiment requires that you continue" or "You have no other choice, you *must* continue."

According to the script, the experiment would be halted when the teacher–subject refused to obey the experimenter's orders to continue. Alternatively, if the teacher–subject obeyed the experimenter, the experiment would be halted once the teacher had progressed all the way to the maximum shock level of 450 volts.

Either way, after the experiment the teacher was interviewed and it was explained that the learner had not actually received dangerous electric shocks. To underscore this point, a "friendly reconciliation" was arranged between the teacher and the learner, and the true purpose of the study was explained to the subject.

The Results of Milgram's Original Experiment

Can you predict how Milgram's subjects behaved? Of the 40 subjects, how many obeyed the experimenter and went to the full 450-volt level? On a more personal level, how do you think *you* would have behaved had you been one of Milgram's subjects?

Milgram himself asked psychiatrists, college students, and middle-class adults to predict how subjects would behave (see Milgram, 1974a). All three groups predicted that *all* of Milgram's subjects would refuse to obey at some point. They predicted that most subjects would refuse at the 150-volt level, the point at which the learner first protested. They also believed that only a few rare individuals would go as far as the 300-volt level. Finally, *none* of those surveyed thought that any of Milgram's subjects would go to the full 450 volts.

As it turned out, they were all wrong. *Two-thirds of Milgram's subjects—26 of the 40—were fully compliant and went to the full 450-volt level.* And of those who defied the experimenter, *not one stopped before the 300-volt level.* Table 12.4 on the next page shows the results of Milgram's original obedience study.

Surprised? Milgram himself was stunned by the results, never expecting that the majority of subjects would administer the maximum voltage. Were his results a fluke? Did Milgram inadvertently assemble a sadistic group of New Haven residents who were all too willing to inflict extremely painful, even life-threatening, shocks on a complete stranger?

The answer to both these questions is no. Milgram's obedience study has been repeated many times in the United States and other countries (see Blass, 2000). And, in fact, Milgram (1974a) replicated his own study on numerous occasions, using variations of his basic experimental procedure.

In one replication, for instance, Milgram's subjects were 40 women. Were female subjects any less likely to inflict pain on a stranger? Not at all. The results were identical. Confirming Milgram's results since then, eight other studies also found no sex differences in obedience to an authority figure (see Blass, 2000, 2004; Burger, 2009).

TABLE 12.1

The Results of Milgram's Original Study

Shock Level	Switch Labels and Voltage Levels	Number of Subjects Who Refused to Administer a Higher Voltage Level
	Slight Shock	
1	15	
2	30	
3	45	
4	60	
	Moderate Shock	
5	75	
6	90	
7	105	
8	120	
9	135	
10	150	
11	165	
12	180	
	Very Strong Shock	
13	195	
14	210	
15	225	
16	240	
	Intense Shock	
17	255	
18	270	
19	285	
20	300	
	Extreme Intensity Shock	
21	315	5
22	330	
23	345	4
24	360	2
	Danger: Severe Shock	1
25	375	1
26	390	
27	405	1
28	420	
	XXX	
29	435	
30	450	26

Contrary to what psychiatrists, college students, and middle-class adults predicted, the majority of Milgram's subjects did not refuse to obey by the 150-volt level of shock. As this table shows, 14 of Milgram's 40 subjects (35 percent) refused to continue at some point after administering 300 volts to the learner. However, 26 of the 40 subjects (65 percent) remained obedient to the very end, administering the full 450 volts to the learner.

Source: Milgram (1974a).

Perhaps Milgram's subjects saw through his elaborate experimental hoax, as some critics have suggested (Orne & Holland, 1968). Was it possible that the subjects did not believe that they were really harming the learner? Again, the answer seems to be no. Milgram's subjects seemed totally convinced that the situation was authentic. And they did not behave in a cold-blooded, unfeeling way. Far from it. As the experiment progressed, many subjects showed signs of extreme tension and conflict.

In describing the reaction of one subject, Milgram (1963) wrote, "I observed a mature and initially poised businessman enter the laboratory smiling and confident. Within 20 minutes he was reduced to a twitching, stuttering wreck, who was rapidly approaching a point of nervous collapse."

Making Sense of Milgram's Findings

Multiple Influences

Milgram, along with other researchers, identified several aspects of the experimental situation that had a strong impact on the subjects (see Blass, 1992, 2000; Milgram, 1965). Here are some of the forces that influenced subjects to continue obeying the experimenter's orders:

- **A previously well-established mental framework to obey.** Having volunteered to participate in a psychology experiment, Milgram's subjects arrived at the lab with the mental expectation that they would obediently follow the directions of the person in charge—the experimenter. They also accepted compensation on their arrival, which may have increased their sense of having made a commitment to cooperate with the experimenter.
- **The situation, or context, in which the obedience occurred.** The subjects were familiar with the basic nature of scientific investigation, believed that scientific research was worthwhile, and were told that the goal of the experiment was to "advance the scientific understanding of learning and memory" (Milgram, 1974a). All these factors predisposed the subjects to trust and respect the experimenter's authority (Darley, 1992). Even when subjects protested, they were polite and respectful. Milgram suggested that subjects were afraid that defying the experimenter's orders would make them appear arrogant, rude, disrespectful, or uncooperative.
- **The gradual, repetitive escalation of the task.** At the beginning of the experiment, the subject administered a very low level of shock—15 volts. Subjects could easily justify using such low levels of electric shock in the service of science. The shocks, like the learner's protests, escalated only gradually. Each additional shock was only 15 volts stronger than the preceding one.
- **The experimenter's behavior and reassurances.** Many subjects asked the experimenter who was responsible for what might happen to the learner. In every case, the teacher was reassured that the *experimenter* was responsible for the learner's well-being. Thus, the subjects could believe that they were not responsible for the consequences of their actions. They could tell themselves that their behavior must be appropriate if the experimenter approved of it.
- **The physical and psychological separation from the learner.** Several "buffers" distanced the subject from the pain that he was inflicting on the learner. First, the learner was in a separate room and not visible. Only his voice could be heard.

Second, punishment was depersonalized: The subject simply pushed a switch on the shock generator. Finally, the learner never appealed directly to the teacher to stop shocking him. The learner's pleas were always directed toward the *experimenter*, as in "Experimenter! Get me out of here!" Undoubtedly, this contributed to the subject's sense that the experimenter, rather than the subject, was ultimately in control of the situation, including the teacher's behavior. Similarly, when teachers were told to personally hold the learner's hand down on a "shock plate," obedience dropped to 30 percent. Overall, Milgram demonstrated that the rate of obedience rose or fell depending upon the situational variables the subjects experienced (Zimbardo, 2007).

Conditions That Undermine Obedience

Variations on a Theme

In a lengthy series of experiments, Milgram systematically varied the basic obedience paradigm. To give you some sense of the enormity of Milgram's undertaking, approximately *1,000* subjects, each tested individually, experienced some variation of Milgram's obedience experiment. Thus, Milgram's obedience research represents one of the largest and most integrated research programs in social psychology (Blass, 2000).

By varying his experiments, Milgram identified several conditions that decreased the likelihood of destructive obedience, which are summarized in Figure 12.4. For example, willingness to obey diminished sharply when the buffers that separated the teacher from the learner were lessened or removed, such as when both of them were put in the same room.



From the film *Obedience*, distributed by the New York University Film Library

The Aftereffects of Milgram's Study: Were Subjects Harmed? Milgram's findings were disturbing. But some psychologists found his methods equally upsetting. For example, in one experimental variation, participants were ordered to physically hold the learner's hand on a "shock plate." Thirty percent obeyed. To psychologist Diana Baumrind (1964), it was unethical for Milgram to subject his participants to that level of emotional stress, humiliation, and loss of dignity. But Milgram (1964) countered that he had not set out to create stress in his subjects. It was his unanticipated *results*, not his *methods*, that disturbed people. Who would object to his experiment, he asked, "if everyone had broken off at 'slight shock' or at the first sign of the learner's discomfort?" Concerns were also expressed that participants would experience serious aftereffects from the experiment. However, in a follow-up questionnaire, 84 percent of participants in Milgram's experiment indicated that they were "glad to have taken part in the experiment," and only about 1 percent regretted participating (Milgram, 1974b).

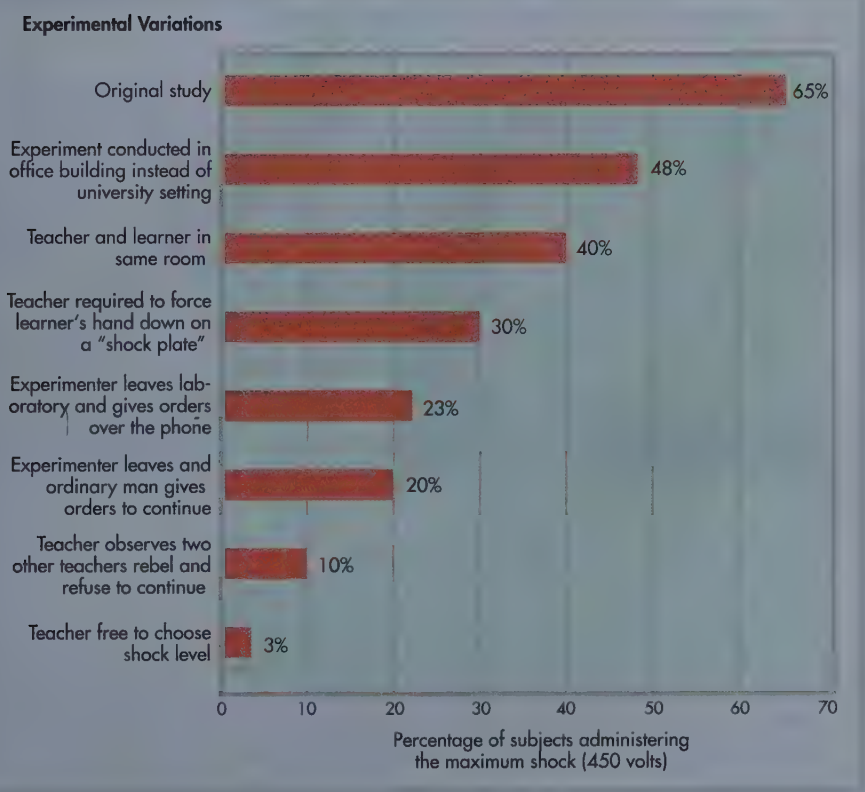


FIGURE 12.4 Factors That Decrease Destructive Obedience By systematically varying his basic experimental design, Milgram identified several factors that diminish the likelihood of destructive obedience. In this graph, you can see the percentage of subjects who administered the maximum shock in different experimental variations. For example, when Milgram's subjects observed what they thought were two other subjects disobeying the experimenter, the real subjects followed their lead 90 percent of the time and refused to continue.

Source: Adapted from data reported in Milgram (1974a).

If Milgram's findings seem to cast an unfavorable light on human nature, there are two reasons to take heart. First, when teachers were allowed to act as their own authority and freely choose the shock level, 95 percent of them did not venture beyond 150 volts—the first point at which the learner protested. Clearly, Milgram's subjects were not responding to their own aggressive or sadistic impulses, but rather to orders from an authority figure (see Reeder & others, 2008).

Second, Milgram found that people were more likely to muster up the courage to defy an authority when they saw others do so. When Milgram's subjects observed what they thought were two other subjects disobeying the experimenter, the real subjects followed their lead 90 percent of the time and refused to continue. Like the subjects in Asch's experiment, Milgram's subjects were more likely to stand by their convictions when they were not alone in expressing them. Despite these encouraging notes, the overall results of Milgram's obedience research painted a bleak picture of human nature.

Many people wonder whether Milgram would get the same results if his experiments were repeated today. Are people still as likely to obey an authority figure? Because ethical rules would prohibit the exact replication of Milgram's experimental set-up, psychologist Jerry Burger (2009) created a partial replication in which certain procedures were modified so as to produce less emotional distress. For example, in order to prevent the participants from becoming overly upset, the experiment was stopped after they reached the 150-volt level. They were also offered multiple opportunities to discontinue their participation.

Despite the fact that Burger made it easier for participants to leave the experiment, the level of obedience was only slightly lower than that found in Milgram's original research almost a half-century ago. And, like Milgram, Burger found no gender differences in obedience. Burger (2009) concluded, "Although changes in societal attitudes can affect behavior . . . the same situational factors that affected Milgram's participants still operate today."

More than 40 years after the publication of Milgram's research, the moral issues that his findings highlighted are still with us. Should military personnel be prosecuted for obeying orders to commit an immoral or illegal act? Who should be held responsible? We discuss a contemporary instance of destructive obedience in the Critical Thinking box on page 512, "Abuse at Abu Ghraib: Why Do Ordinary People Commit Evil Acts?"

Destructive Obedience and Prejudice
Blind obedience to authority combined with ethnic prejudice in Germany during World War II led to the slaughter of millions of Jews in concentration camps. When questioned after the war, Nazi officials and soldiers claimed that they were "just following orders." Over the more than 60 years since the end of World War II, genocide and politically inspired mass killings have occurred in Cambodia, Bosnia, and Rwanda. Today, in the Sudanese Darfur, more than 300,000 people have been killed and thousands more driven from their homes by armed militia groups.



USHMM, courtesy of Tibor Vince



AP Photo/Nasser Nasser, File

Asch, Milgram, and the Real World

Implications of the Classic Social Influence Studies

The scientific study of conformity and obedience has produced some important insights. The first is the degree to which our behavior is influenced by situational factors (see Benjamin & Simpson, 2009; Zimbardo, 2007). Being at odds with the majority or with authority figures is very uncomfortable for most people—enough so that our judgment and perceptions can be distorted and we may act in ways that violate our conscience.

More important, perhaps, is the insight that each of us *does* have the capacity to resist group or authority pressure (Bocchiaro & Zimbardo, 2010). Because the central findings of these studies are so dramatic, it's easy to overlook the fact that some subjects refused to conform or obey despite considerable social and situational pressure (Packer, 2008a). Consider the response of a subject in one of Milgram's later studies (Milgram, 1974a). A 32-year-old industrial engineer named Jan Rensaleer protested when he was commanded to continue at the 255-volt level:

Experimenter: It is absolutely essential that you continue.

Mr. Rensaleer: Well, I won't—not with the man screaming to get out.

Experimenter: You have no other choice.

Mr. Rensaleer: I *do* have a choice. *(Incredulous and indignant)* Why don't I have a choice? I came here on my own free will. I thought I could help in a research project. But if I have to hurt somebody to do that, or if I was in his place, too, I wouldn't stay there. I can't continue. I'm very sorry. I think I've gone too far already, probably.

Like some of the other participants in the obedience and conformity studies, Rensaleer effectively resisted the situational and social pressures that pushed him to obey. As did Army Sergeant Joseph M. Darby, who triggered the investigation of abuses at the Abu Ghraib prison camp in Iraq by turning over a CD with photos of the abuse to authorities. As Darby said, the photos "violated everything that I personally believed in and everything that I had been taught about the rules of war." Another man who took a stand, stopping and then reporting an abusive incident in the prison, was 1st Lieutenant David Sutton. As he put it, "The way I look at it, if I don't do something, I'm just as guilty." Table 12.5 summarizes several strategies that can help people resist the pressure to conform or obey in a destructive, dangerous, or morally questionable situation.

How are such people different from those who conform or obey? Unfortunately, there's no satisfying answer to that question. No specific personality trait consistently predicts conformity or obedience in experimental situations such as those Asch and Milgram created (see Blass, 2000, 2004; Burger, 2009). In other words, the social influences that Asch and Milgram created in their experimental situations can be compelling even to people who are normally quite independent.

Finally, we need to emphasize that conformity and obedience are not completely bad in and of themselves. Quite the contrary. Conformity and obedience are necessary for an orderly society, which is why such behaviors were instilled in all of us as children. The critical issue is not so much whether people conform or obey, because we all do so every day of our lives. Rather, the critical issue is whether the norms we conform to, or the orders we obey, reflect values that respect the rights, well-being, and dignity of others.

TABLE 12.5

Resisting an Authority's Unacceptable Orders

- Verify your own discomfort by asking yourself, "Is this something I would do if I were controlling the situation?"
- Express your discomfort. It can be as simple as saying, "I'm really not comfortable with this."
- Resist even slightly objectionable commands so that the situation doesn't escalate into increasingly immoral or destructive obedience.
- If you realize you've already done something unacceptable, stop at that point rather than continuing to comply.
- Find or create an excuse to get out of the situation and validate your concerns with someone who is not involved with the situation.
- Question the legitimacy of the authority. Most authorities have legitimacy only in specific situations. If authorities are out of their legitimate context, they have no more authority in the situation than you do.
- If it is a group situation, find an ally who also feels uncomfortable with the authority's orders. Two people expressing dissent in harmony can effectively resist conforming to the group's actions.

Sources: Milgram, 1963, 1974a; Asch, 1956, 1957; Haney & others, 1973; Zimbardo, 2000, 2004, 2007; Blass, 1991, 2004; American Psychological Association, 2005.

Helping Behavior

Coming to the Aid of Strangers

KEY THEME

› Prosocial behavior describes any behavior that helps another person, including altruistic acts.

KEY QUESTIONS

› What factors increase the likelihood that people will help a stranger?

› What factors decrease the likelihood that people will help a stranger?

› How can the lack of bystander response in the Genovese murder case be explained in light of psychological research on helping behavior?

It was about 3:20 A.M. on Friday, March 13, 1964, when 28-year-old Kitty Genovese returned home from her job managing a bar. Like other residents in her middle-class New York City neighborhood, she parked her car at an adjacent railroad station. Her apartment entrance was only 100 feet away.



Daily News Pix

Kitty Genovese (1935–1964)
Known as Kitty by her friends, Genovese had grown up in Brooklyn. As a young woman, she managed a sports bar in Queens, shown here.

CRITICAL THINKING

Abuse at Abu Ghraib: Why Do Ordinary People Commit Evil Acts?

When the first Abu Ghraib photos appeared, Americans were shocked. The photos graphically depicted Iraqi prisoners being humiliated, abused, and beaten by U.S. military personnel at Abu Ghraib prison. In one photo, an Iraqi prisoner stood naked with feces smeared on his face and body. In another, naked prisoners were piled in a pyramid. Military guard dogs threatened and bit naked prisoners. A hooded prisoner stood on a box with wires dangling from his outstretched arms. Smiling American soldiers, both male and female, posed alongside the corpse of a beaten Iraqi prisoner, giving the thumbs-up sign for the camera.

In the international uproar that followed, U.S. political leaders and Defense Department officials scrambled, damage control at the top of their lists. "A few bad apples" was the official pronouncement—just isolated incidents of overzealous or sadistic soldiers run amok. The few "bad apples" were identified and arrested: nine members of an Army Reserve unit that was based in Cresaptown, Maryland.

Why would ordinary Americans mistreat people like that? How can normal people commit such cruel, immoral acts?

> Unless we learn the dynamics of "why," we will never be able to counteract the powerful forces that can transform ordinary people into evil perpetrators.
>
> —*Philip Zimbardo, 2004b*

What actually happened at Abu Ghraib?

At its peak population in early 2004, the Abu Ghraib prison complex, some 20 miles west of Baghdad, housed more than 6,000 Iraqi detainees. These were Iraqis who had been detained during the American invasion and occupation of Iraq. The detainees ranged from petty thieves and other criminals to armed insurgents. But also swept up in the detention were many Iraqi civilians who seemed guilty only of being in the wrong place at the wrong time. The prison complex was short of food, water, and basic sanitary facilities, understaffed, and poorly supervised (James, 2008).

There had been numerous reports that prisoners were being mistreated at Abu Ghraib, including official complaints by the International Red Cross. However, most Americans had no knowledge of the prison conditions until late April 2004, when the photographs documenting shocking incidents of abuse were shown on national television and featured in the *New Yorker* magazine (Hersh, 2004a, 2004b).

The worst incidents took place in a particular cell block that was controlled by military intelligence personnel rather than regular Army military police. This cell block held the prisoners who were thought to be most dangerous and who had been identified as potential "terrorists" or "insurgents" (Hersh, 2005). The Army Reserve soldiers assigned to guard these prisoners were told that their role was to assist military intelligence by "loosening up" the prisoners for later interrogation (Taguba, 2004).



Would you have obeyed? "I was instructed by persons in higher rank to 'stand there, hold this leash, look at the camera,'" Lynndie England (2005) said. Among those calling the shots was her then-lover, Corporal Charles Graner, the alleged ringleader who was sentenced to 10 years in prison for his attacks on Iraqi detainees. Graner, England, and one other reservist were convicted of mistreatment and given prison sentences, while the other six reservists made plea deals. No officers were court-martialed or charged with any criminal offense, although some were fined, demoted, or relieved of their command.

What factors contributed to the events that occurred at Abu Ghraib prison?

Multiple elements combined to create the conditions for brutality, including *in-group versus out-group thinking*, *negative stereotypes*, *dehumanization*, and *prejudice*. The Iraqi prisoners were of a different culture, ethnic group, and religion than the prison guards, none of whom spoke Arabic. To the American prison guards, the Arab prisoners represented a despised, dangerous, and threatening outgroup. Categorizing the prisoners in this way allowed the guards to *dehumanize* the detainees, who were seen as subhuman (Fiske & others, 2004).

Because the detainees were presumed to be potential terrorists, the guards were led to believe that it was their duty to mistreat them in order to help extract useful information. In this way, aggression was transformed from being inexcusable and inhumane into a virtuous act of patriotism (Kelman, 2005; Post, 2011). Thinking in this way also helped reduce any *cognitive dissonance* the soldiers might have been experiencing by *justifying* the aggression. "I was doing what I believed my superiors wanted me to do," said Army Reserve Private Lynndie England (2004), a file clerk from West Virginia.

Is what happened at Abu Ghraib similar to what happened in Milgram's studies?

Milgram's controversial studies showed that even ordinary citizens will obey an authority figure and commit acts of destructive obedience. Some of the accused soldiers, like England, did claim that they were "just following orders." The photographs of England with naked prisoners, especially the one in which she was holding a naked male prisoner on a leash, created international outrage and revulsion. But England (2004) testified that her superiors praised the photos and told her, "Hey, you're doing great, keep it up."

But were the guards "just following orders"?

During the investigation and court-martials, soldiers who were called as witnesses for the prosecution testified that no *direct* orders were given to abuse or mistreat any prisoners (Zernike, 2004). However, as

a classic and controversial experiment by Stanford University psychologist Philip Zimbardo and his colleagues (1973) showed, *implied* social norms and roles can be just as powerful as explicit orders.

The Stanford Prison Experiment was conducted in 1971 (Haney & others, 1973). Twenty-four male college students were randomly assigned to be either prisoners or prison guards. They played their roles in a makeshift, but realistic, prison that had been set up in the basement of a Stanford University building. All of the participants had been evaluated and judged to be psychologically healthy, well-adjusted individuals.

> The value of the Stanford Prison Experiment resides in demonstrating the evil that good people can be readily induced into doing to other good people within the context of socially approved roles, rules, and norms . . .
>
> —*Philip Zimbardo, 2000a*

Originally, the experiment was slated to run for two weeks. But after just six days, the situation was spinning out of control. As Zimbardo (2005) recalls, "Within a few days, [those] assigned to the guard role became abusive, red-necked prison guards. Every day the level of hostility, abuse, and degradation of the prisoners became worse and worse. Within 36 hours the first prisoner had an emotional breakdown, crying, screaming, and thinking irrationally." Prisoners who did not have extreme stress reactions became passive and depressed.

While Milgram's experiments showed the effects of *direct authority pressure*, the Stanford Prison Experiment demonstrated the powerful influence of *situational roles* and *conformity to implied social rules and norms*. These influences are especially pronounced in vague or novel situations (Zimbardo, 2007). In confusing or ambiguous situations, *normative social influence* is more likely. When people are not certain what to do, they tend to rely on cues provided by others and to conform their behavior to that of those in their immediate group (Fiske & others, 2004).

At Abu Ghraib, the accused soldiers received no special training and were ignorant of either international or Army regulations regarding the treatment of civilian detainees or enemy prisoners of war (see James, 2008; Zimbardo, 2007). Lynndie England, for example, was a file clerk, not a prison guard. In the chaotic cell block, the guards apparently took their cues from one another and from the military intelligence personnel who encouraged them to "set the conditions" for interrogation (Hersh, 2005; Taguba, 2004).

Are people helpless to resist destructive obedience in a situation like Abu Ghraib prison?

No. As Milgram demonstrated, *people can and do resist pressure to perform evil actions.* Not all military personnel at Abu Ghraib went along with the pressure to mistreat prisoners (Hersh, 2005; Taguba, 2004). Consider these examples:

- National Guard 1st Lieutenant David Sutton stopped the abuse of a prisoner by other soldiers and immediately reported it to his commanding officer.
- Master-at-Arms William J. Kimbro, a Navy dog handler, adamantly refused to participate in improper interrogations using dogs to intimidate prisoners despite being pressured by military intelligence personnel (Hersh, 2004b).
- When handed a CD filled with digital photographs depicting prisoners being abused and humiliated, Specialist Joseph M. Darby turned it over to the Army Criminal Investigation Division. It was Darby's conscientious action that finally prompted a formal investigation of the prison.

At the court-martials, army personnel called as prosecution witnesses testified that the abusive treatment shown in the photographs would never be allowed under any stretch of the normal rules for handling inmates in a military prison (Zernike, 2004).

In fact, as General Peter Pace, chairman of the Joint Chiefs of Staff, stated forcefully in a November 2005 press conference, "It is absolutely the responsibility of every U.S. service member, if they see inhumane treatment being conducted, to intervene to stop it. . . . If they are physically present when inhumane treatment is taking place, they have an *obligation* to try to stop it."

Finally, it's important to point out that understanding the factors that contributed to the events at Abu Ghraib does *not* excuse the perpetrators' behavior or absolve them of individual responsibility. And, as Milgram's research shows, the action of even one outspoken dissenter can inspire others to resist unethical or illegal commands from an authority figure (Packer, 2008a).

CRITICAL THINKING QUESTIONS

- How might the fundamental attribution error lead people to blame "a few bad apples" rather than noticing situational factors that contributed to the Abu Ghraib prison abuse?
- Who should be held responsible for the inhumane conditions and abuse that occurred at Abu Ghraib prison?



AP Photo/Lt.M.Otero

Accepting Responsibility At her trial, Lynndie England, the file clerk from a small town in West Virginia, apologized for her actions. In an interview after her conviction, England (2005) said that she was still "haunted" by memories of events in the prison. She would always feel guilty, she said, "for doing the wrong thing, posing in pictures when I shouldn't have, degrading [the prisoners] and humiliating them—and not saying anything to anybody else to stop it."



Edward Hausner/The New York Times Pictures/Redux

The Murder Scene At the end of the sidewalk you can see the railroad station where Genovese parked her car. Along the sidewalk are entrances to shops as well as stairways leading to apartments above the shops. After Genovese staggered to the entrance of her apartment, her attacker returned and stabbed her to death. Later investigations suggested that there may have been fewer than 38 witnesses' stories, and that some of those witnesses could not have seen the attacks from their windows (Manning & others, 2007, 2008). Nevertheless, the essential story is true: Many people heard Genovese's screams, yet no one stepped forward to help (Brock, 2008).

As she got out of her car, she noticed a man at the end of the parking lot. When the man moved in her direction, she began walking toward a nearby police call box, which was under a streetlight in front of a bookstore. On the opposite side of the street was a 10-story apartment building. As she neared the streetlight, the man grabbed her and she screamed. Across the street, lights went on in the apartment building. "Oh, my God! He stabbed me! Please help me! Please help me!" she screamed.

"Let that girl alone!" a man yelled from one of the upper apartment windows. The attacker looked up, then walked off, leaving Kitty on the ground, bleeding. The street became quiet. Minutes passed. One by one, lights went off. Struggling to her feet, Kitty made her way toward her apartment. As she rounded the corner of the building moments later, her assailant returned, stabbing her again. "I'm dying! I'm dying!" she screamed.

Again, lights went on. Windows opened and people looked out. This time, the assailant got into his car and drove off. It was now 3:35 A.M. Fifteen minutes had passed since Kitty's first screams for help. A New York City bus passed by. Staggering, then crawling, Kitty moved toward the entrance of her apartment. She never made it. Her attacker returned, searching the apartment entrance doors. At the second apartment entrance, he found her, slumped at the foot of the steps. This time, he stabbed her to death.

It was 3:50 A.M. when someone first called the police. The police took just two minutes to arrive at the scene. About half an hour later, an ambulance carried Kitty Genovese's body away. Only then did people come out of their apartments to talk to the police.

Over the next two weeks, police investigators learned that a total of 38 people had witnessed Kitty's murder—a murder that involved three separate attacks over a period of about 30 minutes. Why didn't anyone try to help her? Or call the police when she first screamed for help?

When the *New York Times* interviewed various experts, they seemed baffled, although one expert said it was a "typical" reaction (Mohr, 1964). If there was a common theme in their explanations, it seemed to be "apathy." The occurrence was simply representative of the alienation and depersonalization of life in a big city, people said (see Rosenthal, 1964a, 1964b).

Not everyone bought this pat explanation. In the first place, it wasn't true. As social psychologists **Bibb Latané** and **John Darley** (1970) later pointed out in their landmark book, *The Unresponsive Bystander: Why Doesn't He Help?:*

> People often help others, even at great personal risk to themselves. For every "apathy" story, one of outright heroism could be cited. . . . It is a mistake to get trapped by the wave of publicity and discussion surrounding incidents in which help was not forthcoming into believing that help never comes. People sometimes help and sometimes don't. What determines when help will be given?



AP Photo/Al Golub

Prosocial Behavior in Action Many people volunteer their time and energy to help others. In Modesto, California, Doug Lilly volunteers for "Meals on Wheels." Along with delivering meals to about 65 elderly residents each week, Lilly also checks to make sure they are safe and healthy.

That's the critical question, of course. When do people help others? And why do people help others?

When we help another person with no expectation of personal benefit, we're displaying **altruism** (Batson & others, 2011). An altruistic act is fundamentally selfless—the individual is motivated purely by the desire to help someone in need. Everyday life is filled with little acts of altruistic kindness, such as Fern giving the "homeless" man a handful of quarters or the stranger who thoughtfully holds a door open for you as you juggle an armful of packages.

Altruistic actions fall under the broader heading of **prosocial behavior,** which describes any behavior that helps another person, whatever the underlying motive. Note that prosocial behaviors are not necessarily altruistic. Sometimes we help others out of guilt. And, sometimes we help others in order to gain something, such as recognition, rewards, increased self-esteem, or having the favor returned (Batson & others, 2011).

altruism Helping another person with no expectation of personal reward or benefit.

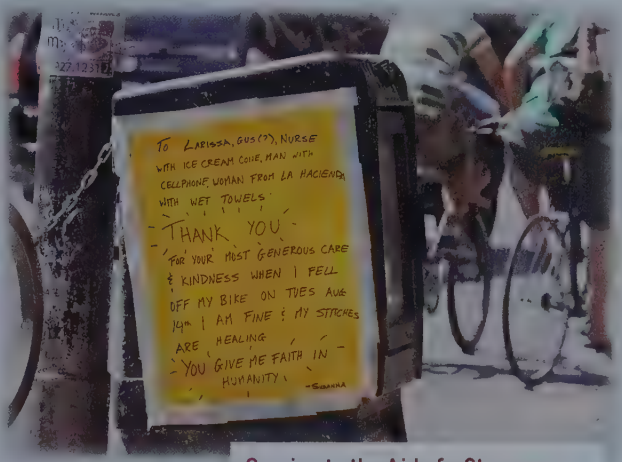
prosocial behavior Any behavior that helps another, whether the underlying motive is self-serving or selfless.

Factors That Increase the Likelihood of Bystanders Helping

Kitty Genovese's death triggered hundreds of investigations into the conditions under which people will help others (Dovidio, 1984; Dovidio & others, 2006). Those studies began in the 1960s with the pioneering efforts of Latané and Darley, who conducted a series of ingenious experiments in which people appeared to need help. Often, these studies were conducted using locations in and around New York City as a kind of open-air laboratory.

Other researchers joined the effort to understand what factors influence a person's decision to help another (see Dovidio & others, 2006; Fischer & others, 2011). Some of the most significant factors that have been found to increase the likelihood of helping behavior are noted below.

- **The "feel good, do good" effect.** People who feel good, successful, happy, or fortunate are more likely to help others (see Forgas & others, 2008; C. Miller, 2009). Those good feelings can be due to virtually any positive event, such as receiving a gift, succeeding at a task, listening to pleasant music, finding a small amount of money, or even just enjoying a warm, sunny day.
- **Feeling guilty.** We tend to be more helpful when we're feeling guilty. For example, after telling a lie or inadvertently causing an accident, people were more likely to help others (Basil & others, 2006; de Hooge & others, 2011). Even guilt induced by surviving the 9/11 terrorist attacks spurred helping behavior in many people during the aftermath (Wayment, 2004).
- **Seeing others who are willing to help.** Whether it's donating blood, helping a stranded motorist change a flat tire, or dropping money in the Salvation Army kettle during the holiday season, we're more likely to help if we observe others do the same (Fischer & others, 2011).
- **Perceiving the other person as deserving help.** We're more likely to help people who are in need of help through no fault of their own. For example, people are twice as likely to give some change to a stranger if they believe the stranger's wallet has been stolen than if they believe the stranger has simply spent all his money (Burn, 2009; Latané & Darley, 1970; Laner & others, 2001).
- **Knowing how to help.** Research has confirmed that knowing what to do and being physically capable of helping contributes greatly to the decision to help someone else (Fischer & others, 2011; Steg & de Groot, 2010).
- **A personalized relationship.** When people have any sort of personal relationship with another person, they're more likely to help that person. Even minimal social interaction with each other, such as making eye contact, engaging in small talk, or smiling, increases the likelihood that one person will help the other (Solomon & others, 1981; Vrugt & Vet, 2009).



Miles Storey

Coming to the Aid of a Stranger
Everyday life is filled with examples of people who come to the aid of a stranger in distress, like this sign posted at the corner of Toronto's Queen and Palmerston streets. Without knowing any details beyond those written on the sign, can you identify factors that might have contributed to the helping behavior of the bystanders in this situation?

Factors That Decrease the Likelihood of Bystanders Helping

It's equally important to consider influences that decrease the likelihood of helping behavior. As we look at some of the key findings, we'll also note how each factor might have played a role in the death of Kitty Genovese.

The Bystander Effect: What Would You Do?
What would you do if you came across a man lying crumpled on the ground on a college campus? Would you stop to help him, call campus security, or look away and hurry past? What factors in the scene shown in the photograph make it more or less likely that the woman will stop to try to help a stranger?



Reyer Boxem/Hollandse Hoogte/Redux

- **The presence of other people.** In general, people are much more likely to help when they are alone (Latané & Nida, 1981; Fischer & others, 2010). If other people are present or imagined, helping behavior declines—a phenomenon called the **bystander effect.**

There seem to be two major reasons for the bystander effect. First, the presence of other people creates a **diffusion of responsibility.** The responsibility to intervene is *shared* (or *diffused*) among all the onlookers. Because no one person feels all the pressure to respond, each bystander becomes less likely to help.

Ironically, the sheer number of bystanders seemed to be the most significant factor working against Kitty Genovese. Remember that when she first screamed, a man yelled down, "Let that girl alone!" With that, each observer instantly knew that he or she was not the only one watching the events on the street below. Hence, no single individual felt the full responsibility to help. Instead, there was a diffusion of responsibility among all the bystanders so that each individual's share of responsibility was small indeed.

Second, the bystander effect seems to occur because each of us is motivated to some extent by the desire to behave in a socially acceptable way (*normative social influence*) and to appear correct (*informational social influence*). Thus, we often rely on the reactions of others to help us define a situation and guide our response to it. In the case of Kitty Genovese, the lack of intervention by any of the witnesses may have signaled the others that intervention was not appropriate, wanted, or needed.

- **Being in a big city or a very small town.** Kitty Genovese was attacked late at night in one of the biggest cities in the world. Research by Robert Levine and his colleagues (2008) confirmed that people are less likely to help strangers in big cities, but other aspects of city life also affect helping. Crowding, economic status, and even how fast people are walking can influence whether a person is helped or not. On the other hand, people are *also* less likely to help a stranger in towns with populations under 5,000 (Steblay, 1987).
- **Vague or ambiguous situations.** When situations are ambiguous and people are not certain that help is needed, they're less likely to offer help (Solomon & others, 1978). The ambiguity of the situation may also have worked against Kitty Genovese. The people in the apartment building saw a man and a woman struggling on the street below but had no way of knowing whether the two were acquainted. "We thought it was a lovers' quarrel," some of the witnesses later said (Gansberg, 1964). Researchers have found that people are especially reluctant to intervene when the situation appears to be a domestic dispute or a "lovers' quarrel," because they are not certain that assistance is wanted (Gracia & others, 2009).
- **When the personal costs for helping outweigh the benefits.** As a general rule, we tend to weigh the costs as well as the benefits of helping in deciding whether to act. If the potential costs outweigh the benefits, it's less likely that people will help (Fischer & others, 2006, 2010). The witnesses in the Genovese case may have

bystander effect A phenomenon in which the greater the number of people present, the less likely each individual is to help someone in distress.

diffusion of responsibility A phenomenon in which the presence of other people makes it less likely that any individual will help someone in distress because the obligation to intervene is shared among all the onlookers.

felt that the benefits of helping Genovese were outweighed by the potential hassles and danger of becoming involved in the situation.

On a small yet universal scale, the murder of Kitty Genovese dramatically underscores the power of situational and social influences to affect our behavior. Although social psychological research has provided insights about the factors that influenced the behavior of those who witnessed the Genovese murder, it should not be construed as a justification for the inaction of the bystanders. After all, Kitty Genovese's death probably could have been prevented by a single phone call. If we understand the factors that decrease helping behavior, we can recognize and overcome those obstacles when we encounter someone who needs assistance. If *you* had been Kitty Genovese—or if Kitty Genovese had been your sister, friend, or classmate—how would *you* have hoped other people would react?

CONCEPT REVIEW 12.3

Factors Influencing Conformity, Obedience, and Helping Behavior

Circle the letter of the correct answer.

1. Although Matt prefers to dress casually, he wears a button-down shirt and tie to work because he wants to fit in with the other sales representatives. Matt's behavior is best explained as a matter of:
   a. informational social influence
   b. obedience
   c. normative social influence
   d. collectivistic culture

2. According to Stanley Milgram, which of the following statements helps explain the teachers' willingness to deliver progressively stronger shocks to the learner in the original obedience experiment?
   a. The teachers were selected on the basis of their willingness to inflict pain in the name of scientific research.
   b. The experimenter warned the teachers that they would be severely punished if they disobeyed his orders.
   c. The teachers were physically and psychologically separated from the learner.
   d. The average person is willing to blame an authority figure for his or her own behavior.

3. Conformity and obedience research suggests that:
   a. people are innately predisposed to be cruel and aggressive
   b. people are much less likely to conform or obey if they observe someone else who is defiant in the situation
   c. only on rare occasions does someone resist group or authority pressure
   d. extraverted people are most likely to resist group or authority pressure

4. Ashley is elated as she drives home from work because she has just received an unexpected promotion and a big raise in salary. As she pulls into her driveway, she notices her elderly neighbor struggling to clear the snow from the sidewalk in front of her home. How will Ashley respond?
   a. Ashley is unlikely to help her, because she lives in a very small town.
   b. Ashley is likely to help her, because of the "feel good, do good" effect.
   c. Ashley is unlikely to help her, because of the just-world effect.
   d. Ashley is likely to help her, because of the diffusion of responsibility effect.

The Influence of Groups on Individual Behavior

KEY THEME

› Individual behavior can be strongly influenced by the presence of others.

KEY QUESTIONS

› What are social loafing and social striving?

› What are social facilitation and deindividuation?

In our discussions of conformity, obedience, and altruism, we have touched on a variety of ways in which the presence of other people influences an individual's thoughts and behavior. In this section, we'll focus directly on how the behavior of individuals can be affected by being part of a group. As you'll see, the diffusion of responsibility that can occur when a group of people observes someone who needs help also contributes to other aspects of group behavior.



L. Kolvoord/The Image Works

Social Loafing These teenagers, hard at work at a Habitat for Humanity building project in Austin, Texas, demonstrate that social loafing does not always take place. When people know the other members of their group, social loafing is less likely to occur. What other factors make social loafing less likely?

Social Loafing

When Individual Effort Is "Lost in the Crowd"

The performance and motivation of individuals who are part of a group can be influenced by many different factors (Hogg, 2010). Whether it's cheering, clapping, or rope pulling, people tend to expend less effort on collective tasks than they do when performing the same task alone, a phenomenon called **social loafing.** Social loafing is especially pronounced when it's difficult or impossible to assess each individual's contribution to the collective effort. As a general rule, the greater the number of people involved in a collective effort, the lower each individual's output (Karau & Williams, 1993).

Is social loafing inevitable in any group task? Not at all. Psychologists Steven Karau and Kipling Williams (1993) conducted a meta-analysis of more than 70 social loafing studies. Collectively, the studies indicate that social loafing is reduced or eliminated when (1) the group is composed of people we know, (2) we are members of a highly valued group, or (3) the task is meaningful or unique. Interestingly, some gender differences also surfaced. Women are generally less likely to engage in social loafing than are men. And when the group size increases, the degree of social loafing increases for men, but not for women (Kerr & Tindale, 2004).

Why does social loafing occur? Like the diffusion of responsibility that occurs when a group witnesses someone who needs help, a similar diffusion of responsibility seems to occur among group members working on a collective task. The responsibility for attaining the group goal is spread across all the group members, resulting in reduced effort by each individual group member (Latané, 1981). Social loafing can also occur because people expect other group members to slack off. To keep the situation equitable, people reduce their efforts to match the level of effort they expect other group members to display (see Kerr & Tindale, 2004).

Cultural Variations: Social Striving

Social loafing is a common phenomenon in individualistic cultures. However, cross-cultural psychologists have found that social loafing is not only absent, but *reversed* in many collectivistic cultures, including in China, Israel, and Japan (Hong & others, 2008; M. Bond & Smith, 1996). That is, individuals worked *harder* when they were in groups than when they were alone—a pattern referred to as *social striving*. In the China and Israel studies, those participants who most highly endorsed collectivistic values were most likely to demonstrate increased performance and productivity in groups (M. Bond & Smith, 1996).

Why is social loafing less pronounced or even absent in collectivistic cultures? In collectivistic cultures, group success tends to be more highly valued than individual success. The contributions made by individuals to group success are also more highly valued than they are in individualistic cultures. Finally, the social norms in collectivistic cultures encourage a sense of social responsibility and hard work within groups (Karau & Williams, 1993).

social loafing The tendency to expend less effort on a task when it is a group effort.

social facilitation The tendency for the presence of other people to enhance individual performance.

deindividuation The reduction of self-awareness and inhibitions that can occur when a person is a part of a group whose members feel anonymous.

Social Facilitation

Individual Performance in the Presence of Others

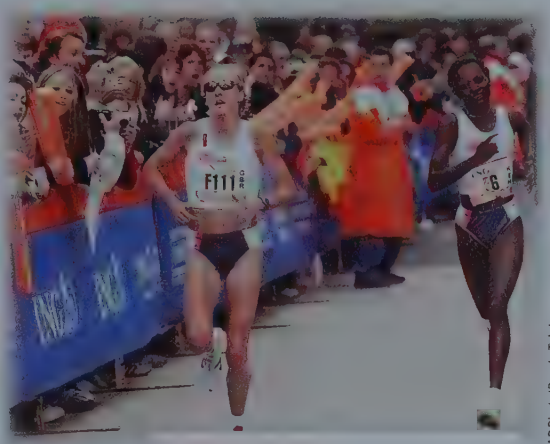
When your individual efforts go undetected and are "lost in the crowd," individual performance may drop. But what if your individual efforts are *not* lost in the crowd, but instead are the focus of the crowd's attention? Would your performance then be the same in the presence of others as it would be if you were working alone?

Partly, it depends on the complexity of the task that you're trying to perform. When a task is relatively simple or well rehearsed, the presence of other people tends

to enhance individual performance, a pattern called **social facilitation.** So when others are watching you perform simple multiplication tables, your individual performance tends to improve. However, if the task is complex or poorly learned, such as a complex memory task, the opposite effect can occur: The presence of other people is likely to *hinder* performance (Allport, 1920, 1924; Travis, 1925).

How can this be explained? Several factors are involved (Geen, 1995; Guerin, 2003). The presence of others tends to increase our level of arousal and motivation, possibly because of concerns over being favorably or unfavorably evaluated by others. When a task is simple or well learned, increased motivation, spurred on by the anticipation of being positively evaluated, seems to work to our benefit. Under these conditions, social facilitation often occurs: Individual performance is *better* in the presence of others. Hence, a well-trained athlete is likely to perform better when others are present than when alone (Guerin, 1986).

However, when the task is complex or poorly learned, arousal coupled with apprehension about being negatively evaluated tends to work against us. Under these conditions, the presence of others can diminish an individual's performance. For example, the apprehensive actor who is not as well rehearsed as he should be may end up missing cues and flubbing lines in front of the opening night audience.



AP Photo/Ramin Talaie

Social Facilitation As the crowd watches and applauds their performance, these professional runners are likely to turn in some of their best running times. When does the presence of other people facilitate the performance of a task? When does it work against us?

Deindividuation

When Group Members Feel Anonymous

What happens when you combine the increased arousal due to the presence of others with the diffusion of responsibility that characterizes social loafing and the bystander effect? In combination, increased arousal and a diminished sense of responsibility can lead to deindividuation. **Deindividuation** refers to the reduction of self-awareness and inhibitions that can occur when a person is part of a group whose members feel anonymous (Zimbardo, 2004).

Under these conditions, people may do things that they wouldn't do if they were alone or identifiable. In this way, deindividuation can lead to irresponsible or antisocial behaviors. For example, deindividuation can help explain adolescent acts of vandalism on Halloween. Succumbing to the feeling of anonymity provided by darkness and Halloween masks, groups of otherwise law-abiding teenagers may commit minor acts of vandalism, such as smashing pumpkins, stealing Halloween decorations, and damaging mailboxes.

Much more serious consequences can result from the deindividuation that occurs in a mob or during a riot. The large crowd of people and general social chaos heighten both arousal and the sense of anonymity. This volatile combination can lead to mobs of rioting people who smash windows, steal, and injure innocent bystanders.

Similarly, onlookers are more likely to taunt someone who is threatening a suicidal jump when the incident occurs at night. The darkness of the night adds to the sense of anonymity felt by members of the crowd, who sometimes collectively start chanting, "Jump! Jump! Jump!" Not surprisingly, people are much *less* likely to urge on the would-be jumper when they are in small groups or during the day, when there is less of a sense of anonymity (Mann, 1981).

How can deindividuation be counteracted? An important element of deindividuation is the reduced sense of self-awareness (Diener, 1980; Mullen & others, 2003). Thus, one way to counteract deindividuation is to heighten self-awareness. For example, when a mirror was placed above a bowl of Halloween candy, unattended trick-or-treaters were less likely to take more candy than they were told they could take (Beaman & others, 1979). Simply seeing their own faces in the mirror increased personal self-awareness and reduced impulsive, dishonest actions. In contrast, trick-or-treaters who did not see their faces in a mirror were more likely to take more candy than they were supposed to.



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Deindividuation: Anonymity and Reduced Self-Awareness Hats, scarves, and masks heightened the sense of anonymity felt by rioters in London during the summer of 2011. So did the general chaos on the streets, where throngs of people set fire to cars and looted local shops. Such factors add to the likelihood that people will commit antisocial acts that they would not commit if their identities were known (Morrell & others, 2011).

CONCEPT REVIEW 12.4

Influence of Groups on Individual Behavior

Match each example with the correct concept.

a. social loafing
b. social striving
c. social facilitation
d. deindividuation

_____ 1. Nina's best running time during practice was 5 minutes and 12 seconds for one mile. During the actual race, however, her time improved to 4 minutes and 42 seconds for one mile.

_____ 2. A team of workers in a car factory in Thailand is much more productive than are the individual team members when they work alone.

_____ 3. In a social psychology experiment, university students picked up less litter per person when they were members of a large group than when they worked alone.

_____ 4. When the Slammers won the play-offs on Friday night, the excitement and chaos following the game turned into a riot, and several stores were looted.



CLOSING THOUGHTS

We began this chapter with a prologue about Fern trying to help a stranger in a strange city. As it turned out, Fern's social perceptions of the man were inaccurate: He was not a homeless person living on the streets of San Francisco. As simple as this incident was, it underscored a theme that was repeatedly echoed throughout our subsequent discussions of person perception, attribution, and attitudes. Our subjective impressions, whether they are accurate or not, play a pivotal role in how we perceive and think about other people.

A different theme emerged in our later discussions of conformity, obedience, and helping behavior. Social and situational factors, especially the behavior of others in the same situation, can have powerful effects on how we act at a given moment. But like Fern, each of us has the freedom to choose how we respond in a given situation. When we're aware of the social forces that influence us, it can be easier for us to choose wisely.

In the final analysis, we are social animals who often influence one another's thoughts, perceptions, and actions, sometimes in profound ways. In the following Enhancing Well-Being with Psychology section, we'll look at some of the ways that social psychological insights have been applied by professional persuaders—and how you can counteract attempts to persuade you.

persuasion The deliberate attempt to influence the attitudes or behavior of another person in a situation in which that person has some freedom of choice.

ENHANCING WELL-BEING WITH PSYCHOLOGY

The Persuasion Game

At the time, our daughter, Laura, was only 3 1/2 years old, happily munching her Cheerios and doodling pictures in the butter on her bread. Don sat across from her at the kitchen table, reading a draft of this chapter. "Don't play with your food, Laura," Don said without looking up.

"Okay, Daddy," she chirped. "Daddy, are you in a happy mood?" Don paused. "Yes, I'm in a happy mood, Laura," he said thoughtfully. "Are you in a happy mood?"

"Yes, Daddy," Laura replied as she made the banana peel dance around her placemat. "Daddy, will you get me a Mermaid Barbie doll for my birthday?"

Ah, so young and so clever! From very early in life, we learn the basics of **persuasion**—the deliberate attempt to influence the attitudes or behavior of another person in a situation in which that person has some freedom of choice. Clearly, Laura had figured out one basic rule: She's more likely to persuade Mom or Dad when they're in "a happy mood."

Professional persuaders often manipulate people's attitudes and behavior using techniques based on two fundamental social norms: the rule of reciprocity and the rule of commitment (Cialdini & Sagarin, 2005). Here we'll provide you with some practical suggestions to avoid being taken in by persuasion techniques.

The Rule of Reciprocity

The *rule of reciprocity* is a simple but powerful social norm (Burger & others, 2009; Shen & others, 2011). If someone gives you something or does you a favor, you feel obligated to return the favor. So after a classmate lets you copy her lecture notes for the class session you missed, you feel obligated to return a favor when she asks for one.

The "favor" can be almost anything freely given, such as a free soft drink, a free food sample in a grocery store, a free gardening workshop at your local hardware store, a free guide, booklet, planning kit, or trial. The rule of reciprocity is part of the sales strategy used by companies that offer "free" in-home trials of their products. It's also why department stores that sell expensive cosmetics offer "free" makeovers.

Technically, you are under "no obligation" to buy anything. Nonetheless, the tactic often creates an uncomfortable sense of obligation, so you do feel pressured to reciprocate by buying the product (Cialdini, 2009).

One strategy that uses the rule of reciprocity is called the *door-in-the-face technique* (Turner & others, 2007). First, the persuader makes a large request that you're certain to refuse. For example, Joe asks to borrow $500. You figuratively "slam the door in his face" by quickly turning him down. But then Joe, apologetic, appears to back off and makes a much smaller request—to borrow $20. From your perspective, it appears that Joe has made a concession to you and is trying to be reasonable. This puts you in the position of reciprocating with a concession of your own. "Well, I can't lend you $500," you grumble, "but I guess I could lend you 20 bucks." Of course, the persuader's real goal was to persuade you to comply with the second, smaller request.

The rule of reciprocity is also operating in the *that's-not-all technique* (Burger, 2011). First, the persuader makes an offer. But before you can accept or reject it, the persuader appears to throw in something extra to make the deal even more attractive to you. So as you're standing there mulling over the price of the more expensive high-definition, flat-panel television, the salesperson says, "Listen, I'm offering you a great price but that's not all I'll do—I'll throw in some top-of-the-line HDMI connector cables at no charge." From your perspective, it appears as though the salesperson has just done you a favor by making a concession you did not ask for. This creates a sense of obligation for you to reciprocate by buying the "better" package.

The Rule of Commitment

Another powerful social norm is the *rule of commitment*. Once you make a public commitment, there is psychological and interpersonal pressure on you to behave consistently with your earlier commitment. The *foot-in-the-door technique* is one strategy that capitalizes on the rule of commitment (Guéguen & others, 2008; Rodafinos & others, 2005). Here's how it works.

First, the persuader makes a small request that you're likely to agree to. For example, she might stop you on the street and ask you to sign a petition supporting some social cause. By agreeing to do so, you've made a small *commitment* to the social cause. At that point, she has gotten her "foot in the door." Next, the persuader asks you to comply with a second, larger request, such as making a donation to the group she represents. Because of your earlier commitment, you feel psychologically pressured to behave consistently by now agreeing to the larger commitment (Cialdini, 2009).

The rule of commitment is also operating in the *low-ball technique*. First, the persuader gets you to make a commitment by deliberately understating the cost of the product you want. He's thrown you a "low ball," one that is simply too good to turn down. In reality, the persuader has no intention of honoring the artificially low price.

Here's an example of the low-ball technique in action: You've negotiated an excellent price (the "low ball") on a used car and filled out the sales contract. The car salesman shakes your hand and beams, then takes your paperwork into his manager's office for approval. Ten minutes pass—enough time for you to convince yourself that you've made the right decision and solidify your commitment to it.

At that point, the salesman comes back from his manager's office looking dejected. "I'm terribly sorry," the car salesman says. "My manager won't let me sell the car at that price because we'd lose too much money on the deal. I told him I would even take a lower commission, but he won't budge."

Notice what has happened. The attractive low-ball price that originally prompted you to make the commitment has been pulled out from under your feet. What typically happens? Despite the loss of the original inducement to make the purchase—the low-ball price—people often feel compelled to keep their commitment to make the purchase even though it is at a higher price (Cialdini, 2009).

Defending Against Persuasion Techniques

How can you reduce the likelihood that you'll be manipulated into making a decision that may not be in your best interest? Here are three practical suggestions.

1. Sleep on it.

Persuasive transactions typically occur quickly. Part of this is our own doing. We've finally decided to go look at a new laptop, automobile, or whatever, so we're psychologically primed to buy the product. The persuader uses this psychological momentum to help coax you into signing on the dotted line right then and there. It's only later, of course, that you sometimes have second thoughts. So when you think you've got the deal you want, tell the persuader that you always sleep on important decisions before making a final commitment.

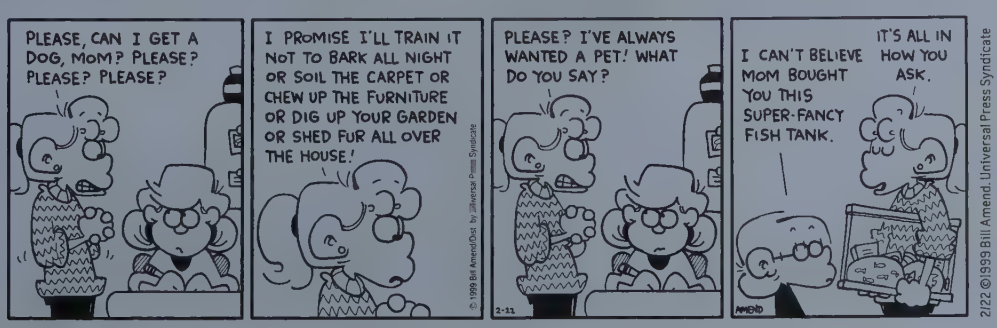
The sleep-on-it rule often provides an opportunity to discover whether the persuader is deliberately trying to pressure or manipulate you. If the persuader responds to your sleep-on-it suggestion by saying something like, "This offer is good for today only," then it's likely that he or she is afraid that your commitment to the deal will crumble if you think about it too carefully or look elsewhere.

2. Play devil's advocate.

List all of the reasons why you should *not* buy the product or make a particular commitment (Albarracín & Vargas, 2010; Crano & Prislin, 2006). Arguing *against* the decision will help activate your critical thinking skills. It's also helpful to discuss important decisions with a friend, who might be able to point out disadvantages that you have overlooked.

3. When in doubt, do nothing.

Learn to trust your gut feelings when something doesn't feel quite right. If you feel that you're being psychologically pressured or cornered, you probably are. As a general rule, if you feel any sense of hesitation, lean toward the conservative side and do nothing. If you take the time to think things over, you'll probably be able to identify the source of your reluctance.





CHAPTER REVIEW

Social Psychology

KEY POINTS

Introduction: What Is Social Psychology?

- **Social psychology** is the scientific study of how individuals think, feel, and behave in social situations. **Social cognition** and **social influence** are two important areas of research in social psychology.

Person Perception: *Forming Impressions of Other People*

- **Person perception** is an active and subjective process that occurs in an interpersonal context. The interpersonal context includes the characteristics of the individual you are judging, your own characteristics, and the situation.
- Person perception is influenced by subjective perceptions, personal goals, **social norms,** and self-perception.
- People often rely on social categories when they evaluate others. **Social categorization** may be automatic or deliberate. Using social categories is cognitively efficient but can lead to inaccurate conclusions.
- Because we expect certain traits and behaviors to go together, we often form and rely on implicit personality theories in person perception. **Implicit personality** theories provide a mental framework that organizes observations, memories, and beliefs about other people. One common implicit personality theory is "what is beautiful is good." However, there are few personality differences between attractive and less attractive people.

Attribution: *Explaining Behavior*

- The **attribution** process refers to how we infer the cause of our own or another person's behavior. Attributions can strongly influence our opinions of other people, but the attribution process is susceptible to many biases.
- Two important attributional biases are the **fundamental attribution error** and the self-serving bias. The **just-world hypothesis,** along with the fundamental attribution error, contributes to **blaming the victim** of a tragedy. In some collectivistic cultures, people display the modesty, or self-effacing, bias and are less prone to making the fundamental attribution error than are people in individualistic cultures.

The Social Psychology of Attitudes

- An **attitude** is a learned tendency to evaluate an object, person, or issue in a particular way. This evaluation is usually positive or negative, but may be ambivalent. Attitudes can have cognitive, emotional, and behavioral components.
- Attitudes are likely to determine behaviors when they are extreme or expressed frequently, when they have been formed through direct experience, when people are very knowledgeable about the attitude object, when people have a vested interest in the subject of the attitude, and when people expect a favorable outcome from acting in accordance with their attitude.
- When behavior conflicts with attitudes, **cognitive dissonance** may occur, and people may change their attitudes to conform to their behavior.

Understanding Prejudice

- **Prejudice** refers to a negative attitude toward people who belong to a specific social group. **Stereotypes** are characteristics associated with all members of particular social groups. Relying on stereotypes can have many negative consequences. Stereotyped thinking can distort perception and cause us to inaccurately prejudge individuals. Once formed, stereotypes resist change.
- Judgments of others are also influenced by whether they are members of the **in-group** or an **out-group.** We're more likely to use negative stereotypes to evaluate members of out-groups. The **out-group homogeneity effect, in-group bias,** and **ethnocentrism** are three forms of bias that can result from in-group/out-group thinking.
- Stereotypes form the cognitive basis for prejudicial attitudes. Prejudice also has emotional and behavioral components. **Implicit attitudes** are preferences that are unintentional and sometimes unconscious, and are measured by the Implicit Association Test.
- Muzafer Sherif demonstrated that intergroup conflict can be decreased when groups engage in a cooperative effort. Cooperative learning is one way of reducing prejudice in classrooms.

Conformity: *Following the Crowd*

- **Social influence** is the psychological study of how behavior is influenced by the social environment and other people. **Conformity** occurs when people change their behavior, attitudes, or beliefs in response to real or imagined group pressure. Sometimes people conform publicly but not privately.
- Research by Solomon Asch demonstrated the degree to which people will conform to a majority view and the conditions under which conformity is most likely. **Normative** and **informational social influence** both contribute to conformity.
- Conformity is generally higher in collectivistic cultures than in individualistic cultures. Conformity to group norms is viewed less negatively in many collectivistic cultures than it is in individualistic cultures.

Obedience: *Just Following Orders*

- **Obedience** was studied most extensively by Stanley Milgram. In Milgram's original obedience experiment, the subject (the "teacher") thought he was delivering ever-increasing levels of electric shock to another person (the "learner"). In contrast to predictions, most of the subjects obeyed the experimenter and progressed to the maximum shock level.
- Milgram identified several powerful aspects of the original experimental situation that influenced subjects to obey the experimenter and continue delivering electric shocks. In later experiments, Milgram also identified several situational factors that made people less likely to obey.
- Asch's research on conformity and Milgram's research on obedience demonstrate the degree to which behavior is influenced by situational factors.

Helping Behavior: *Coming to the Aid of Strangers*

- The scientific study of helping behavior—**altruism** and **prosocial behavior**—was spurred by the murder of Kitty Genovese in front of 38 witnesses. Although no one intervened to save Genovese, sometimes people do help strangers.
- Bibb Latané and John Darley extensively studied the circumstances under which people will help a stranger. Several factors have been identified that affect the likelihood of bystander intervention. **Diffusion of responsibility** is the most important factor that explains the **bystander effect.**

The Influence of Groups on Individual Behavior

- Individual behavior can be strongly influenced by the presence of others. In **social loafing,** people expend less effort when working as a group on a collective task than when working alone on the same task. Social loafing is less likely when we know the other people in a group, when we are members of a highly valued group, or when a task is meaningful or unique.
- Social loafing is reduced or reversed in some collectivistic cultures. Instead, individuals expend more effort when they are working in a group on a collective task, a phenomenon known as social striving.
- Under some conditions, the presence of others enhances individual performance, a phenomenon called social facilitation. **Social facilitation** is most likely when a task is simple or well rehearsed. Performance decreases when a task is complex or poorly learned.
- **Deindividuation** can occur when increased arousal due to the presence of others is combined with diffusion of responsibility and anonymity. Deindividuation can lead to antisocial behaviors, but it can be reduced if self-awareness is heightened.

KEY TERMS

social psychology, p. 486
sense of self, p. 486
social cognition, p. 486
social influence, p. 486
person perception, p. 487
social norms, p. 487
social categorization, p. 488
explicit cognition, p. 488
implicit cognition, p. 488
implicit personality theory, p. 488
attribution, p. 491
fundamental attribution error, p. 491
blaming the victim, p. 491
hindsight bias, p. 491
just-world hypothesis, p. 491
self-serving bias, p. 492
attitude, p. 494
cognitive dissonance, p. 496
prejudice, p. 497
stereotype, p. 498
in-group, p. 499
out-group, p. 499
out-group homogeneity effect, p. 499
in-group bias, p. 499
ethnocentrism, p. 499
implicit attitudes, p. 500
conformity, p. 503
normative social influence, p. 504
informational social influence, p. 504
obedience, p. 505
altruism, p. 514
prosocial behavior, p. 515
bystander effect, p. 516
diffusion of responsibility, p. 516
social loafing, p. 518
social facilitation, p. 519
deindividuation, p. 519
persuasion, p. 520

KEY PEOPLE

Solomon Asch (1907–1996) American social psychologist who is best known for his pioneering studies of conformity. (p. 503)

John M. Darley (b. 1938) Contemporary American social psychologist who, along with co-researcher Bibb Latané, is best known for his pioneering studies of bystander intervention in emergency situations. (p. 514)

Bibb Latané (b. 1937) Contemporary American social psychologist who, along with co-researcher John Darley, is best known for his pioneering studies of bystander intervention in emergency situations. (p. 514)

Stanley Milgram (1933–1984) American social psychologist who is best known for his controversial series of studies investigating destructive obedience to an authority. (p. 505)

Muzafer Sherif (1906–1988) American social psychologist who is best known for his Robbers Cave experiments to study prejudice, conflict resolution, and group processes. (p. 501)

Philip G. Zimbardo (b. 1933) American social psychologist, known for his research on cognitive dissonance and social influence, and especially for the Stanford Prison Experiment, which demonstrated how situational forces can impact behavior. (p. 496)

CONCEPT REVIEW ANSWERS

12.1 page 493

1. c 2. e 3. d 4. b 5. a

12.2 page 503

1. stereotyping
2. out-group homogeneity
3. in-group bias
4. cognitive dissonance
5. ethnocentrism

12.3 page 517

1. c 2. c 3. b 4. b

12.4 page 520

1. c 2. b 3. a 4. d



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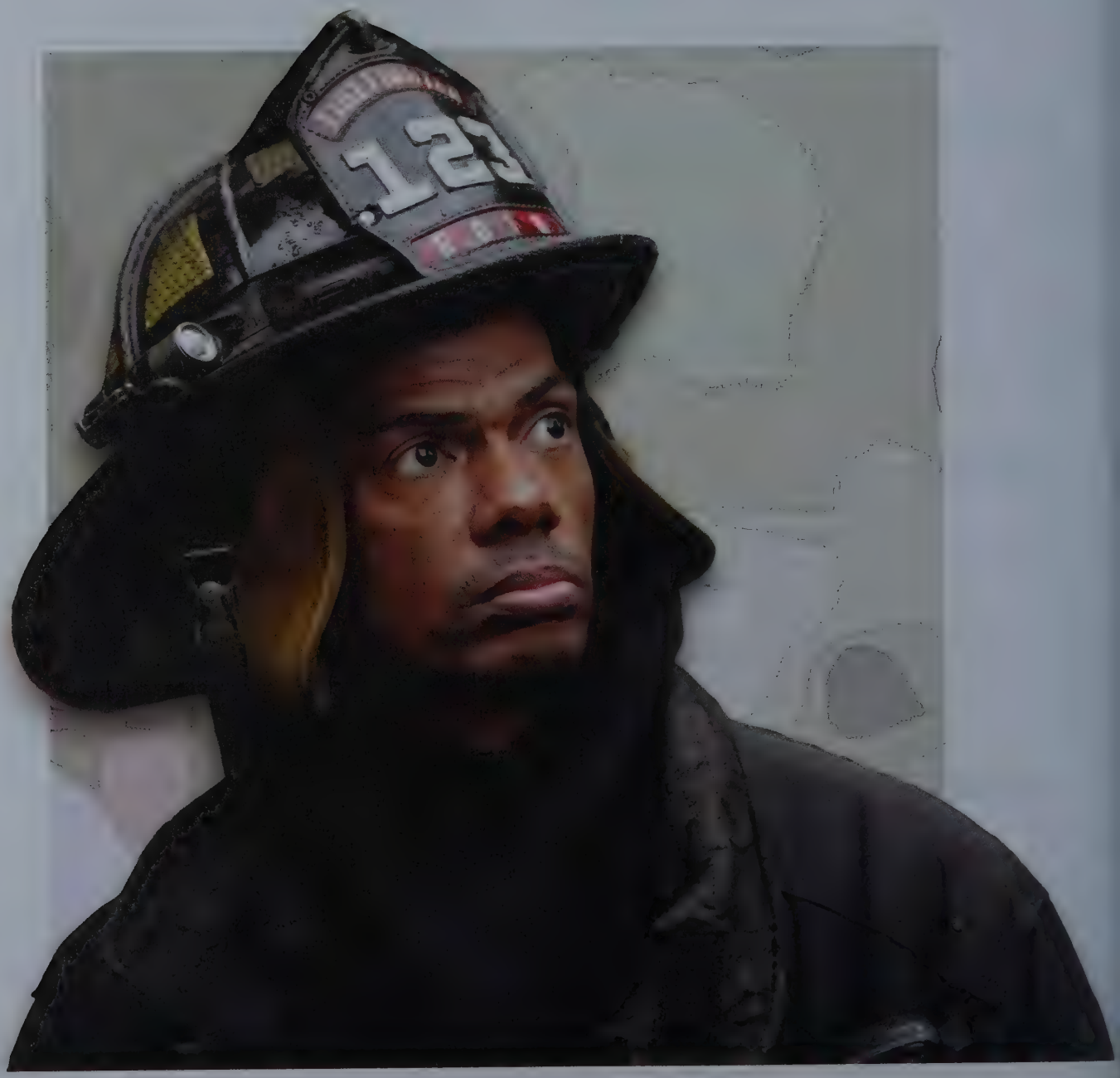
The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.





CHAPTER 13

Stress, Health, and Coping







Fire and Ash

PROLOGUE

HAWK WOKE UP, LUNGS AND EYES burning. Her friend's smoking always bothered her, but this couldn't just be cigarette smoke.

Pulling on her boots, Hawk went outside. Everything was saturated in a sickly, orange light. The air was filled with smoke, obscuring the sky and burning her throat. What was going on?

Hawk answered her ringing cell phone. "Hawk!" her mother said forcefully. "You need to come home, NOW. There's a fire over in Fourmile Canyon. We have to evacuate! Get up here right away and pack up whatever stuff you want to take with you."

Hawk's mind started racing. It was her last summer in the small house high in the pines above Boulder, Colorado, where she had lived her entire life. She had enlisted in the Air Force right after finishing high school and was due to report for boot camp in just a few weeks. Her stomach tightened as she realized that she might not have a home to return to.

Feeling numb, Hawk sped to the edge of town. The road up the mountain was blocked off, and a man wearing a Boulder County sheriff's uniform stopped her. "This area is closed now," he barked. "You should have come earlier!" But Hawk hadn't earned her nickname by being easily cowed. No one even noticed as she drove right up the mountain behind one of the fire department SUVs.

Standing in the doorway to her room, Hawk looked around blankly. She started grabbing items—clothes, sketchpads, her laptop. She panicked when she couldn't find the little box that held her father's medals and photos from his Marine service in Vietnam. She grabbed the flag that the Air Force had given her grandmother when her grandfather died.

"Hawk, come on, we need to leave," her mother called. Taking one last look around her room, Hawk reluctantly ran back down the stairs to her car. Most of their neighbors had already left. Chalk marked the doors to show that the sheriff had checked to make sure that no one was left inside.

Almost 1500 miles away, Andi had just returned from kayaking along the Washington coast. It was Labor Day, the last day of her vacation before she headed home to Colorado. Late that afternoon, she checked her e-mail.

To: Andi
Subject: Fourmile fire
Hi, Andi,
Wanted to let you know of a fire that may be headed toward your house. They are evacuating Fourmile and Sunshine Canyons, and Sugarloaf, too.
I know you're not home so you're safe but wanted to let you know.
Andrea

IN THIS CHAPTER:

- Introduction: Stress and Health Psychology
- Physical Effects of Stress: The Mind–Body Connection
- Individual Factors That Influence the Response to Stress
- Coping: How People Deal with Stress
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Minimizing the Effects of Stress



Greg Cortopassi http://cortoimages.com

Andi called her house. Four rings, and then the answering machine picked up. That meant the power was still on—and her house was still standing.

Meanwhile, back in Colorado, your author Sandy was anxiously monitoring the situation. Although nowhere near the path of the fire, she could see and smell the thick plumes of black smoke that filled the sky. When darkness came, brilliant orange flames flickered all over the distant foothills, punctuated by occasional bursts of light when the fire flared up. Online, there were emergency bulletins, Twitter feeds, and even a Facebook page with posts about the fire, but there was nothing that could tell her whether her friends' homes had survived the fast-moving flames. No one knew anything other than that the fire was out of control and spreading rapidly.

Thousands of mountain residents had been forced to evacuate, some fleeing flames that reached 200 feet into the air. One man reported that his bumper had melted in the intense heat as he drove through the fire. State and federal firefighting teams had been called in to help the local volunteer departments.

Andi called home again. This time, her call went straight to voicemail. "At that moment," Andi said, "I knew my house was gone." All she had left was her car, one suitcase of clothes, her laptop, her kayak, and her dog, Nellie.

For days, the hot, dry winds blew, and the wildfires burned out of control. Firefighters fought to contain the fire and protect as many homes as they could. Trees and houses continued to explode. New fires broke out all over the rugged canyons and hills northwest of Boulder. "BOULDER ON EDGE," the headlines read. An additional nine thousand people were told to prepare to evacuate their homes.

A few hardy souls hiked into the burn area on back-country trails or trained scopes from nearby peaks to see if their homes were still standing. Rumors flew, and the evacuees clamored for information at public meetings. But authorities were too busy fighting the fire to survey areas that were already destroyed.

Five days after the fire began, Hawk was able to return to her home, smoke-damaged, but thankfully, still standing. Six thousand acres had burned, and 169 homes were completely destroyed. Andi's house, where she had lived for 20 years, had burned to the ground.

Your author Sandy was one of a small group of friends who accompanied Andi in a caravan up to her land. The long dirt road to her property went through a blackened, barren, almost lunar-looking landscape. Stark against the blue sky and bare dirt were the charred skeletons of what had once been trees.

And Andi's house? The main floor had completely collapsed into the lower floor, where we could make out the blackened outlines of her toppled woodstove and dishwasher. Twisted pipes. Chunks of melted glass and metal, pieces of exploded pottery. There was nothing left—nothing but a six-inch-deep pile of rubble and ashes. "Wow," someone said softly.

Andi sucked in her breath and swallowed hard. She tried to say something cheerful, but it was all she could do to hold back tears. She had steeled herself to expect the worst, but nothing had prepared her for such complete devastation.

Most members of the community breathed a sigh of relief when the fires were finally out, when people could return home, when life could go back to normal. But for the nearly 200 families who had lost their homes, "normal" was just a memory. Where to live? How to begin replacing not just a house or a few lost treasures, but . . . *everything?*

It took days for Hawk and her mother to wash the soot off their windows, floors, and walls. But for Andi and the others who had lost their homes in the Colorado firestorm, the toughest challenges were ahead of them. As we explore the nature of stress and health psychology, we'll return to their stories.



Photo by Cathy Steiner

Introduction: Stress and Health Psychology

KEY THEME

› When events are perceived as exceeding your ability to cope with them, you experience an unpleasant emotional and physical state called stress.

KEY QUESTIONS

› What is health psychology, and what is the biopsychosocial model?

› How do life events, traumatic events, daily hassles, and burnout contribute to stress?

› What are some social and cultural sources of stress?

As the fires raged on, the word "stress" seemed to be on everyone's lips. A major disaster in a small city has an impact that spreads far beyond those who are immediately affected. Even people whose homes were nowhere near the fire were tense, preoccupied, and worried. The frequent alerts, evacuation warnings, and ongoing uncertainty kept the city on edge. We all seemed to be holding our collective breath, and it wasn't just because of the thick, acrid smoke that made breathing difficult. People developed coughs, headaches, insomnia, and nightmares.

A wildfire raging through a densely populated area is an obvious source of psychological stress. However, most sources of stress are more mundane. As a college student, you are undoubtedly very familiar with feeling "stressed out." Juggling the demands of classes, work, friends, and family can be challenging.

What exactly is *stress*? It's one of those words that is frequently used but is hard to define precisely. Early stress researchers, who mostly studied animals, defined stress in terms of the physiological response to harmful or threatening events (e.g., Selye, 1956). However, people are far more complex than animals in their response to potentially stressful events. And, two people may respond very differently to the same potentially stressful event.

Today, **stress** is generally defined as a negative emotional state occurring in response to events that are perceived as taxing or exceeding a person's resources or ability to cope. This definition emphasizes the important role played by a person's evaluation or *appraisal* of events in the experience of stress. According to the **cognitive appraisal model** developed by **Richard Lazarus,** whether we experience stress depends largely on our *cognitive appraisal* of an event and the resources we have to deal with the event (Lazarus & Folkman, 1984; Smith & Kirby, 2011).

If we think that we have adequate resources to deal with a situation, it will probably create little or no stress in our lives. But if we perceive our resources as being inadequate to deal with a situation we see as threatening, challenging, or even harmful, we'll experience the effects of stress. If our coping efforts are effective, stress will decrease. If they are ineffective, stress will increase. Figure 13.1 on the next page depicts the relationship between stress and appraisal.

In this chapter, we'll take a close look at stress and its effects. We'll also explore the intricate connections between mind and body—or, more accurately, among emotions, thoughts, behavior, physical responses, and health.

To illustrate how thoughts and feelings can affect physical reactions, try this thought experiment. As vividly as you can, recall a time when a close friend said something that made you angry or hurt your feelings. As you remember the details, note any physical sensations that arise. Can you feel your shoulders tensing, your stomach tightening, or a lump in your throat? Has your heart started beating faster or has your face flushed? If so, your thoughts alone produced a fleeting but concrete physical response.

Can positive thoughts and memories also cause physical changes? To answer this, try another thought experiment. Rather than thinking of a painful incident, make a list of people, circumstances, or items for which you are thankful. The items can be as trivial as finding a parking space or as significant as good health. The content of your list doesn't matter, but don't stop until you have managed to come up with at least 10 items, no matter how inconsequential they might seem.

stress A negative emotional state occurring in response to events that are perceived as taxing or exceeding a person's resources or ability to cope.

cognitive appraisal model of stress Developed by Richard Lazarus, a model of stress that emphasizes the role of an individual's evaluation *(appraisal)* of events and situations and of the resources that he or she has to deal with the event or situation.



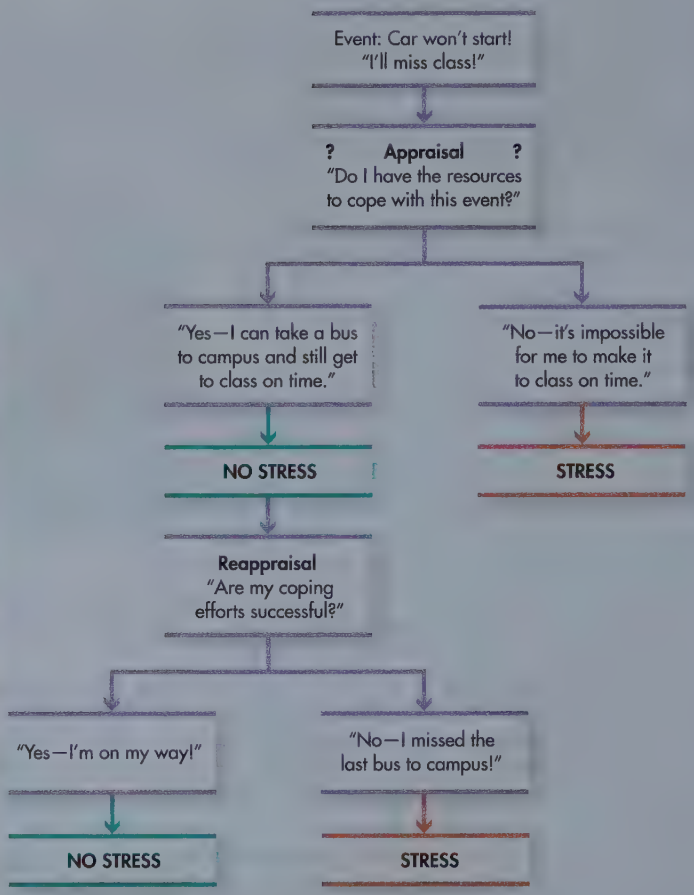
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"Your mother and I are feeling overwhelmed, so you'll have to bring yourselves up."

FIGURE 13.1 Stress and Appraisal
According to Richard Lazarus (1999), events are not stressful in and of themselves. Instead, the experience of stress is determined by your subjective response to external events or circumstances. If you believe you have the resources necessary to meet a challenge, you'll experience little or no stress. We evaluate—and re-evaluate—our coping responses as we deal with stressful circumstances. If our coping efforts are successful, stress will decrease. If unsuccessful, stress will increase.



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As you become more absorbed in this task, called a *gratitude list,* note how your body sensations begin to change. Many people begin to experience feelings of relaxation and calmness when they focus their attention on the things in their life for which they are thankful (Emmons & McCullough, 2003; Seligman & others, 2005). If you did, too, you've just seen how manipulating your thoughts can produce a positive effect on your body. In fact, studies have shown that actively expressing gratitude is linked to better physical health, better relationships, and lower levels of stress and depression (Wood & others, 2008; Seligman & others, 2005).

The relationship between mind and body is a key element in the field of **health psychology,** one of the most rapidly growing specialty areas in psychology. Health psychologists are interested in how psychological, social, emotional, and behavioral factors influence health, illness, and treatment.

Decades of research have confirmed that psychological and social factors make major contributions to physical health—and disease (G. E. Miller & others, 2009; Williams & others, 2011). Social factors that contribute to poor health include poverty, discrimination, and lack of access to medical and psychological care. Psychological factors like stress and depression, and other psychological disorders, also contribute to poor health outcomes. Finally, unhealthy behaviors—such as smoking, substance abuse, and sedentary lifestyles—are themselves leading causes of disability, disease, and death in modern society (Adler, 2009). Thus, health psychologists, with their knowledge of the principles of behavior and behavior change, have an important role to play in encouraging the development of healthy lifestyles—and discouraging unhealthy behaviors.

health psychology The branch of psychology that studies how biological, behavioral, and social factors influence health, illness, medical treatment, and health-related behaviors.

Along with developing strategies to foster emotional and physical well-being, health psychologists investigate issues such as the following:

- How to promote health-enhancing behaviors
- How people respond to being ill
- How people respond in the patient–health practitioner relationship

Health psychologists work with many different health care professionals, including physicians, nurses, social workers, and occupational and physical therapists. In their research and clinical practice, health psychologists are guided by the **biopsychosocial model.** According to this model, health and illness are determined by the complex interaction of *biological factors,* such as genetic predispositions; *psychological factors,* like health beliefs and attitudes; and *social factors,* like family relationships and cultural influences (G. E. Miller & others, 2009). In this chapter, we'll look closely at the roles that different biological, psychological, and social factors play in our experience of health and illness.

biopsychosocial model The belief that physical health and illness are determined by the complex interaction of biological, psychological, and social factors.

stressors Events or situations that are perceived as harmful, threatening, or challenging.

Sources of Stress

Life is filled with potential **stressors**—events or situations that produce stress. Virtually any event or situation can be a source of stress if you question your ability or resources to deal effectively with it (Lazarus & Folkman, 1984; Cooper & Dewe, 2007). In this section, we'll survey some of the most important and common sources of stress.

Life Events and Change

Is *Any* Change Stressful?

Early stress researchers Thomas Holmes and Richard Rahe (1967) believed that any change that required you to adjust your behavior and lifestyle would cause stress. In an attempt to measure the amount of stress people experienced, they developed the *Social Readjustment Rating Scale (SRRS).* The scale included 43 life events that are likely to require some level of adaptation. Each life event was assigned a numerical rating of its relative impact, ranging from 11 to 100 *life change units* (see Table 13.1). Cross-cultural studies have shown that people in many different cultures tend to rank the magnitude of stressful events in a similar way (McAndrew & others, 1998; Wong & Wong, 2006).

According to the life events approach, *any* change, whether positive or negative, is inherently stress-producing. Holmes and Rahe found that people who had accumulated more than 150 life change units within a year had an increased rate of physical or psychological illness (Holmes & Masuda, 1974; Rahe, 1972).

The original life events scale has been revised and updated so that it better weighs the influences of gender, age, marital status, and other individual characteristics (Hobson & Delunas, 2001). New scales have also been developed for specific groups (Dohrenwend, 2006). For instance, the College Student Stress Scale measures unique experiences of college student life that contribute to stress, such as "flunking a class" and "difficulties with parents" (Feldt, 2008).

Despite its popularity, there are several problems with the life events approach. First, the link between scores on the SRRS and the development of physical and psychological problems is relatively weak. In fact, researchers have found, most people weather major life events without developing serious physical or psychological problems (Monroe & Reid, 2009).

Second, the SRRS assumes that a given life event will have the same impact on virtually everyone. But clearly, the stress-producing potential of an event might vary widely from one person to another. For example, if you are in

TABLE 13.1

The Social Readjustment Rating Scale: Sample Items

Life Change	Life Event Units
Death of spouse	100
Divorce	73
Marital separation	65
Death of close family member	63
Major personal injury or illness	53
Marriage	50
Fired at work	47
Retirement	45
Pregnancy	40
Change in financial state	38
Death of close friend	37
Change to different line of work	36
Mortgage or loan for major purchase	31
Foreclosure on mortgage or loan	30
Change in work responsibilities	29
Outstanding personal achievement	28
Begin or end school	26
Trouble with boss	23
Change in work hours or conditions	20
Change in residence	20
Change in social activities	18
Change in sleeping habits	16
Vacation	13
Christmas	12
Minor violations of the law	11

Source: Holmes & Rahe (1967).

The Social Readjustment Rating Scale, developed by Thomas Holmes and Richard Rahe (1967), was an early attempt to quantify the amount of stress experienced by people in a wide range of situations.

Major Life Events and Stress Would the birth of a child or losing your home in a fire both produce damaging levels of stress? According to the life events approach, any event that required you to change or adjust your lifestyle would produce significant stress—whether the event was positive or negative, planned or unexpected. How was the life events approach modified by later research?



Redlink Production/Corbis

a marriage that is filled with conflict, getting divorced (73 life change units) might be significantly less stressful than remaining married.

Third, the life events approach assumes that change in itself, whether good or bad, produces stress. However, researchers have found that negative life events have a more adverse effect on health than positive events (Hatch & Dohrenwend, 2007). Today, most researchers agree that undesirable events are significant sources of stress but that change in itself is not *necessarily* stressful.

Traumatic Events

daily hassles Everyday minor events that annoy and upset people.

One category of life events deserves special mention. *Traumatic events* are events or situations that are negative, severe, and far beyond our normal expectations for everyday life or life events (Robinson & Larson, 2010). Witnessing or surviving a violent attack and experiences associated with combat, warfare or major disasters are examples of the types of events that are typically considered to be traumatic.

Traumatic events are surprisingly common, especially among young adults. One large survey of college students found that 85% reported having been exposed to a traumatic event during their lifetime (Frazier & others, 2009). The most common traumatic events experienced by college students were the unexpected death of a loved one, sexual assault, and family violence.

Traumatic events, even relatively mild ones like a minor car accident, can be very stressful. When traumas are intense or repeated, some psychologically vulnerable people may develop *post-traumatic stress disorder* (abbreviated *PTSD*). As we will see in Chapter 14, PTSD is an anxiety disorder that involves intrusive thoughts of the traumatic event, emotional numbness, and physical symptoms of anxiety, such as nervousness, sleep disturbances, and irritability. However, it's important to note that *most* people recover from traumatic events without ever developing PTSD (Seery & others, 2010). For example, research shows that less than 30% of those who experience major disasters—such as floods, earthquakes, and hurricanes—develop PTSD (Bonanno & others, 2011). In reality, most people are remarkably resilient—a topic we discuss next.

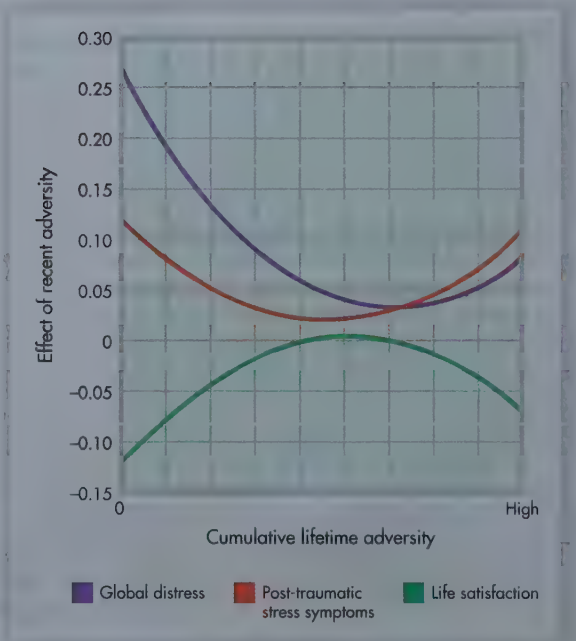


FIGURE 13.2 Whatever Doesn't Kill You Makes You Stronger
Psychologist Mark Seery and his colleagues (2010) found that people who had experienced *some* adversity in their lives handled new stressors better than people who had experienced either a high level of adversity or none at all. After experiencing a significant negative event, they were less distressed and experienced fewer post-traumatic stress symptoms. Even more important, they were generally happier with their lives than people whose lives had been either very hard or relatively carefree.

Source: Seery & others (2010), Figure 3

Developing Resilience

There's a famous saying that "whatever doesn't kill you makes you stronger." Psychologist Mark Seery and his colleagues (2010) set out to test that hypothesis in a multi-year, longitudinal study of the relationship between well-being and exposure to negative life events. They carefully measured health outcomes and *cumulative adversity*—defined as the total amount of negative events experienced over a lifetime—a large, representative sample of U.S. adults.

Seery and his colleagues (2010) found that, as expected, *high* levels of cumulative adversity were associated with poor health outcomes. But, it turned out, so were very *low* levels of adversity. As shown in Figure 13.2, faring best of all were people with a *moderate* level of adversity. They were not

only healthier, but also better able to cope with recent misfortune than people who had experienced either very low or high levels of adversity. Experiencing *some* stress was healthier than experiencing no stress at all.

Why might experiencing some adversity be healthier, in the long run, than living a charmed, stress-free life? Seery argues that people who are *never* exposed to stressful, difficult events don't develop the ability to cope with adversity when it does occur—as it eventually does. And, because they lack confidence in their coping abilities, even minor setbacks can be perceived as overwhelming.

In contrast, people who have had to cope with a moderate level of adversity develop *resilience*—the ability to cope with stress and adversity, to adapt to negative or unforeseen circumstances, and to rebound after negative experiences. Just as moderate exercise builds muscle and aerobic capacity, leading to physical fitness, moderate experience of adversity builds resilience.

Daily Hassles: That's Not What I Ordered!

What made you feel "stressed out" in the past week? Chances are it was not a major life event. Instead, it was probably some unexpected but minor annoyance, such as splotching ketchup on your new T-shirt, misplacing your keys, or getting into an argument with your roommate or a close friend.

Stress researcher Richard Lazarus and his colleagues suspected that such ordinary irritations in daily life might be an important source of stress. To explore this idea, they developed a scale measuring **daily hassles**—everyday occurrences that annoy and upset people (DeLongis & others, 1982; Kanner & others, 1981). Table 13.2 lists examples from the original Daily Hassles Scale and from other scales developed for specific populations.

The frequency of daily hassles is linked to mental and physical illness, unhealthy behaviors, and decreased well-being (O'Connor & others, 2008). Some researchers have found that the number of daily hassles people experience is a better predictor of physical illness and symptoms than is the number of major life events experienced (Almeida & others, 2005).

Why do daily hassles take such a toll? One explanation is that such minor stressors are *cumulative* (Grzywacz & Almeida, 2008). Each hassle may be relatively unimportant in itself, but after a day or two filled with minor hassles, the effects add up. People feel drained, grumpy, and stressed out.

Daily hassles also contribute to the stress produced by major life events. Any major life change can create a ripple effect, generating a host of new daily hassles (Maybery & others, 2007). For example, people who lost their homes in the wildfire had to scramble to find temporary housing and purchase clothes, furniture, pots and pans, and all the other essentials of everyday life that we take for granted. Those who had insurance had to navigate a nightmarish maze of paperwork and regulations. As Andi said, "Imagine if you picked up your house, turned it upside down, and shook it. Now imagine having to describe each and every item that fell out, including where you got it and how much it cost. Think about doing that for every towel, sock, pair of jeans, plate and coffee cup and rug and T-shirt and dog toy that you own. It's a nightmare."

Are there gender differences in the experience of daily hassles? Interpersonal conflict is the most common source of daily stress for *both* men and women (Almeida & others, 2005). However, women are more likely to report daily stress that is associated with friends and family, while males are more likely to feel hassled by stressors that are school- or work-related (Zwicker & DeLongis, 2010). For both sexes, stress at work or school tends to affect home life (Bodenmann & others, 2010). For women, daily stress tends to spill over into their interactions with their partners. Men, on the other hand, are

TABLE 13.2

Examples of Daily Hassles

Daily Hassles Scale

- Concern about weight
- Concern about health of family member
- Not enough money for housing
- Too many things to do
- Misplacing or losing things
- Too many interruptions
- Don't like current work duties
- Traffic
- Car repairs or transportation problems

College Daily Hassles Scale

- Increased class workload
- Troubling thoughts about your future
- Fight with boyfriend/girlfriend
- Concerns about meeting high standards
- Wasting time
- Computer problems
- Concerns about failing a course
- Concerns about money

Acculturative Daily Hassles for Children

- It bothers me when people force me to be like everyone else.
- Because of the group I'm in, I don't get the grades I deserve.
- I don't feel at home here in the United States.
- People think I'm shy, when I really just have trouble speaking English.
- I think a lot about my group and its culture.

Sources: Adapted from Blankstein & Flett, 1992; Kanner & others, 1981; Ross & others, 1999; Staats & others, 2007; Suarez-Morales & others, 2007.

Arguing that "daily hassles" could be just as stress-inducing as major life events, Richard Lazarus and his colleagues constructed a 117-item Daily Hassles Scale. Later, other researchers developed daily hassles scales for specific groups.



Psychologist Richard Lazarus (1922–2002) Lazarus made several influential contributions to the study of stress and coping, including the significance of everyday hassles in producing stress.

Courtesy of Richard S. Lazarus/University of California, Berkeley



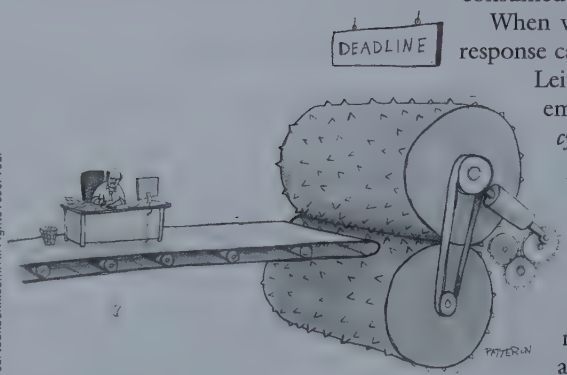
Paula Bronstein/Getty Images

Major Life Events, Daily Hassles, and Stress Food, water, and fuel were still in short supply several days after a devastating earthquake and tsunami hit Japan in March, 2011. Amid destroyed villages and cities, people waited long hours in lines like this one at a supermarket in Ichinoseki, Iwate to buy food and other essentials. The daily hassles created by major disasters add to the high level of stress felt by all those affected.

more likely to simply withdraw. In fact, one study found that the most likely place to find a father after a stressful day at work was sitting alone in a room (Repetti & others, 2009).

Work Stress and Burnout: Is It Quitting Time Yet?

Whether it be due to concerns about job security, unpleasant working conditions, difficult co-workers and supervisors, or unreasonable demands and deadlines, *work stress* can produce a pressure cooker environment that takes a significant toll on your physical health (Nakao, 2010). It can also increase the likelihood of unhealthy behaviors. For example, college students who experienced high levels of work stress also consumed more alcohol than other students (Butler & others, 2010).



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When work stress is prolonged and becomes chronic, it can produce a stress response called **burnout.** There are three key components of burnout (Maslach & Leiter, 2008, 2005). People feel *exhausted,* as if they've used up all of their emotional and physical resources. Second, people experience feelings of *cynicism,* demonstrating negative or overly detached attitudes toward the job or work environment. People often feel unappreciated or as if they are being treated unfairly at work (Demerouti & others, 2010). Third, people feel a sense of *failure or inadequacy.* They may feel incompetent and have a sharply reduced sense of accomplishment or productivity.

One workplace condition that commonly produces burnout is work *overload,* when the demands of the job exceed the worker's ability to meet them (Maslach & Leiter, 2008). A second is *lack of control.* Generally, the more control you have over your work and work environment, the less stressful it is (Wang & others, 2010). Complex, demanding jobs are much less likely to produce feelings of overload, burnout, or stress when workers have control over how they perform those jobs (Chung-Yan, 2010).

However, even in high-stress occupations or demanding work environments, burnout can be prevented. Burnout is least likely to occur when there is a sense of *community* in the workplace (Maslach & Leiter, 2008). Supportive coworkers, a sense of teamwork, and a positive work environment can all buffer workplace stress and prevent burnout.

burnout An unhealthy condition caused by chronic, prolonged work stress that is characterized by exhaustion, cynicism, and a sense of failure or inadequacy.

Social and Cultural Sources of Stress

For disadvantaged groups exposed to crowding, crime, poverty, and substandard housing, everyday living conditions can be a significant source of stress (Gallo & others, 2009; Meyer & others, 2008). People who live under difficult or unpleasant conditions often experience ongoing, or *chronic,* stress (Adler & Rehkopf, 2008).

Chronic stress is also associated with lower *socioeconomic status* (SES), which is a measure of overall status in society (Chandola & Marmot, 2011). The core components of SES are income, education, and occupation. One finding that has been consistent over time and across multiple cultures is the strong association of physical health and longevity with SES (Adler, 2009).

People in lower SES groups tend to experience more negative life events *and* more daily hassles than people in more privileged groups (Hatch & Dohrenwend, 2007). Disadvantaged teenagers and young adults are especially likely to experience high levels of stressful events, particularly violent or life-threatening events. People in less privileged groups also tend to have fewer resources to help them cope with the stressors that they do experience. Thus, it's not surprising that people in the lowest socioeconomic levels tend to have the highest levels of psychological distress, illness, and premature death (Braveman & others, 2010).

Beyond these external factors, low status is in itself highly stressful (Hackman & others, 2010). Many studies have shown that perceiving yourself as being of low social status is associated with poorer physical health—*regardless* of your objective social status as measured by traditional SES measures (Adler, 2009).

The powerful effects of perceived social status were convincingly demonstrated in a recent study (Cohen & others, 2008). Volunteers were exposed to a cold virus (see Figure 13.3). The volunteers who saw themselves as being low on the social status totem pole had higher rates of infection than volunteers who *objectively* matched them on social status measures but did not see themselves as being of low status (Cohen & others, 2008).

Racism and discrimination are another important source of chronic stress for many people (Brondolo & others, 2011; Ong & others, 2009). In one survey, for example, more than three-quarters of African-American adolescents reported being treated as incompetent or dangerous—or both—because of their race (Sellers & others, 2006). Such subtle instances of racism, called *microaggressions,* take a cumulative toll (Sue & others, 2008). Whether it's subtle or blatant, racism significantly contributes to the chronic stress often experienced by members of minority groups.

Stress can also result when cultures clash. For refugees, immigrants, and their children, adapting to a new culture can be extremely stress-producing (Berry, 2003; Jamil & others, 2007). The Culture and Human Behavior box, "The Stress of Adapting to a New Culture" on the next page, describes the factors that influence the degree of stress experienced by people encountering a new culture.

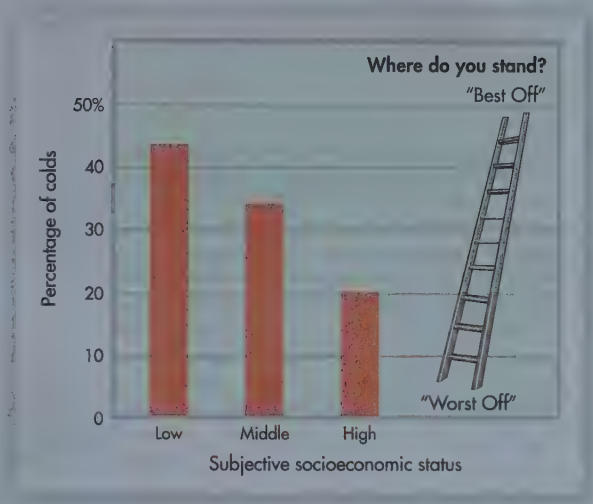


FIGURE 13.3 Subjective Socioeconomic Status and Health The *objective* socioeconomic status of a group of volunteers was assessed in terms of income level and education. The volunteers' *subjective* social status was assessed by showing them a picture of a ladder and asking them to indicate where they thought they stood relative to their fellow Americans in terms of income, education, and occupation. All the volunteers were then exposed to a cold virus. Even after controlling for factors such as smoking and other risk factors, Sheldon Cohen and his colleagues (2008) found that subjective, rather than objective, social status was associated with susceptibility to infection. Regardless of their objective socioeconomic status, participants who perceived themselves as being lower in social status were more susceptible to infection than those who did not.

Source: Cohen & others (2008), Figure 1, p. 272.

Physical Effects of Stress: The Mind-Body Connection

KEY THEME

› Stress affects physical health through its effects on the endocrine system, the immune system, and chromosomes.

KEY QUESTIONS

› What endocrine pathways are involved in the fight-or-flight response and the general adaptation syndrome?

› What are telomeres, and how are they affected by acute and chronic stress?

› What is psychoneuroimmunology, and how does the immune system interact with the nervous system?

From headaches to heart attacks, stress contributes to a wide range of disorders, especially when it is long-term, or chronic. Basically, stress appears to undermine physical well-being in two ways: indirectly and directly.

CULTURE AND HUMAN BEHAVIOR

The Stress of Adapting to a New Culture

Refugees, immigrants, and even international students are often unprepared for the dramatically different values, language, food, customs, and climate that await them in their new land. The process of changing one's values and customs as a result of contact with another culture is referred to as *acculturation*. **Acculturative stress** is the stress that results from the pressure of adapting to a new culture (Sam & Berry, 2010).

Many factors can influence the degree of acculturative stress that a person experiences. For example, when the new society accepts ethnic and cultural diversity, acculturative stress is reduced (Mana & others, 2009). The transition is also eased when the person has some familiarity with the new language and customs, advanced education, and social support from friends, family members, and cultural associations (Schwartz & others, 2010). Acculturative stress is also lower if the new culture is similar to the culture of origin.

Cross-cultural psychologist John Berry (2003, 2006) has found that a person's attitudes are important in determining how much acculturative stress is experienced (Sam & Berry, 2010). When people encounter a new cultural environment, they are faced with two questions: (1) Should I seek positive relations with the dominant society? (2) Is my original cultural identity of value to me, and should I try to maintain it?

The answers produce one of four possible patterns of acculturation: integration, assimilation, separation, or marginalization (see the diagram). Each pattern represents a different way of coping with the stress of adapting to a new culture (Berry, 1994, 2003).

Integrated individuals continue to value their original cultural customs but also seek to become part of the dominant society. They embrace a *bicultural* identity (Hunyh & others, 2011). Biculturalism is associated with higher self-esteem and lower levels of depression, anxiety, and stress, suggesting that the bicultural identity may be the most adaptive acculturation pattern (Schwartz & others, 2010). The successfully integrated individual's level of acculturative stress will be low (Lee, 2010).

Assimilated individuals give up their old cultural identity and try to become part of the new society. They adopt the customs and social values of the new environment, and abandon their original cultural traditions.

Assimilation usually involves a moderate level of stress, partly because it involves a psychological loss—one's previous cultural identity. People who follow this pattern also face the possibility of being rejected either by members of the majority culture or by members of their original culture (Schwartz & others, 2010). The process of learning new behaviors and suppressing old behaviors can also be moderately stressful.



Joe Raedle/Getty Images

Acculturative Stress Acculturative stress can be reduced when immigrants learn the language and customs of their newly adopted home. Here, two friends, one from China, one from Cuba, help each other in an English class in Miami, Florida.

Individuals who follow the pattern of *separation* maintain their cultural identity and avoid contact with the new culture. They may refuse to learn the new language, live in a neighborhood that is primarily populated by others of the same ethnic background, and socialize only with members of their own ethnic group.

In some cases, separation is not voluntary, but is due to the dominant society's unwillingness to accept the new immigrants. Thus, it can be the result of discrimination. Whether voluntary or involuntary, the level of acculturative stress associated with separation tends to be high.

Finally, the *marginalized* person lacks cultural and psychological contact with *both* his traditional cultural group and the culture of his new society. By taking the path of marginalization, he lost the important features of his traditional culture but has not replaced them with a new cultural identity.

Although rare, the path of marginalization is associated with the greatest degree of acculturative stress. Marginalized individuals are stuck in an unresolved conflict between their traditional culture and the new society, and may feel as if they don't really belong anywhere. Fortunately, only a small percentage of immigrants fall into this category (Schwartz & others, 2010).

Question 1: Should I seek positive relations with the dominant society?

Question 2: Is my original cultural identity of value to me, and should I try to maintain it?

	Yes	No
Yes	Integration	Separation
No	Assimilation	Marginalization

Patterns of Adapting to a New Culture According to cross-cultural psychologist John Berry, there are four basic patterns of adapting to a new culture (Sam & Berry, 2010). Which pattern is followed depends on how the person responds to the two key questions shown.

First, stress can *indirectly* affect a person's health by prompting behaviors that jeopardize physical well-being, such as not eating or sleeping properly (Habhab & others, 2009; Mezick & others, 2009). High levels of stress can also interfere with cognitive abilities, such as attention, concentration, memory, and decision making (McNeil & Morgan, 2010; Thompson, 2010). In turn, such cognitive disruptions can increase the likelihood of accidents and injuries.

Second, stress can *directly* affect physical health by altering body functions, leading to physical symptoms, illness, or disease (Zachariae, 2009). For example, people who are under a great deal of stress often tighten their neck and head muscles, resulting in tension headaches. But exactly how do stressful events influence bodily processes, such as muscle contractions?

- **acculturative stress** (ah-CUL-chur-uh-tiv) The stress that results from the pressure of adapting to a new culture.
- **fight-or-flight response** A rapidly occuring chain of internal physical reactions that prepare people either to fight or take flight from an immediate threat.
- **catecholamines** (cat-eh-COLE-uh-meens) Hormones secreted by the adrenal medulla that cause rapid physiological arousal; include adrenaline and noradrenaline.

Stress and the Endocrine System

To explain the connection between stress and health, researchers have focused on how the nervous system, including the brain, interacts with two other important body systems: the endocrine and immune systems. We'll first consider the role of the endocrine system in our response to stressful events and then look at the connections between stress and the immune system.

Walter Cannon

Stress and the Fight-or-Flight Response

Any kind of immediate threat to your well-being is a stress-producing experience that triggers a cascade of changes in your body. As we've noted in previous chapters, this rapidly occurring chain of internal physical reactions is called the **fight-or-flight response.** Collectively, these changes prepare us either to fight or to take flight from an immediate threat.

The fight-or-flight response was first described by American physiologist **Walter Cannon,** one of the earliest contributors to stress research. Cannon (1932) found that the fight-or-flight response involved both the sympathetic nervous system and the endocrine system (see Chapter 2).

With the perception of a threat, the hypothalamus and lower brain structures activate the sympathetic nervous system (see left side of Figure 13.4 on the next page). The sympathetic nervous system stimulates the adrenal medulla to secrete hormones called **catecholamines,** including *adrenaline* and *noradrenaline*. Circulating through the blood, catecholamines trigger the rapid and intense bodily changes associated with the fight-or-flight response. Once the threat is removed, the high level of bodily arousal subsides gradually, usually within about 20 to 60 minutes.

As a short-term reaction, the fight-or-flight response helps ensure survival by swiftly mobilizing internal physical resources to defensively attack or flee an immediate threat. Without question, the fight-or-flight response is very useful if you're suddenly faced with a life-threatening situation, such as having to flee your house when you see a wall of flame come over the ridge. However, if exposure to a threat is prolonged, the intense arousal of the fight-or-flight response can also become prolonged. Under these conditions, Cannon believed, the fight-or-flight response could prove harmful to physical health.



Walter B. Cannon (1875–1945) Cannon made many lasting contributions to psychology, including an influential theory of emotion, which we discussed in Chapter 8. During World War I, Cannon's research on the effects of stress and trauma led him to identify the body's response to threatening circumstances—the *fight-or-flight response.*

Edgar Fahs Smith Collection, University of Pennsylvania Library

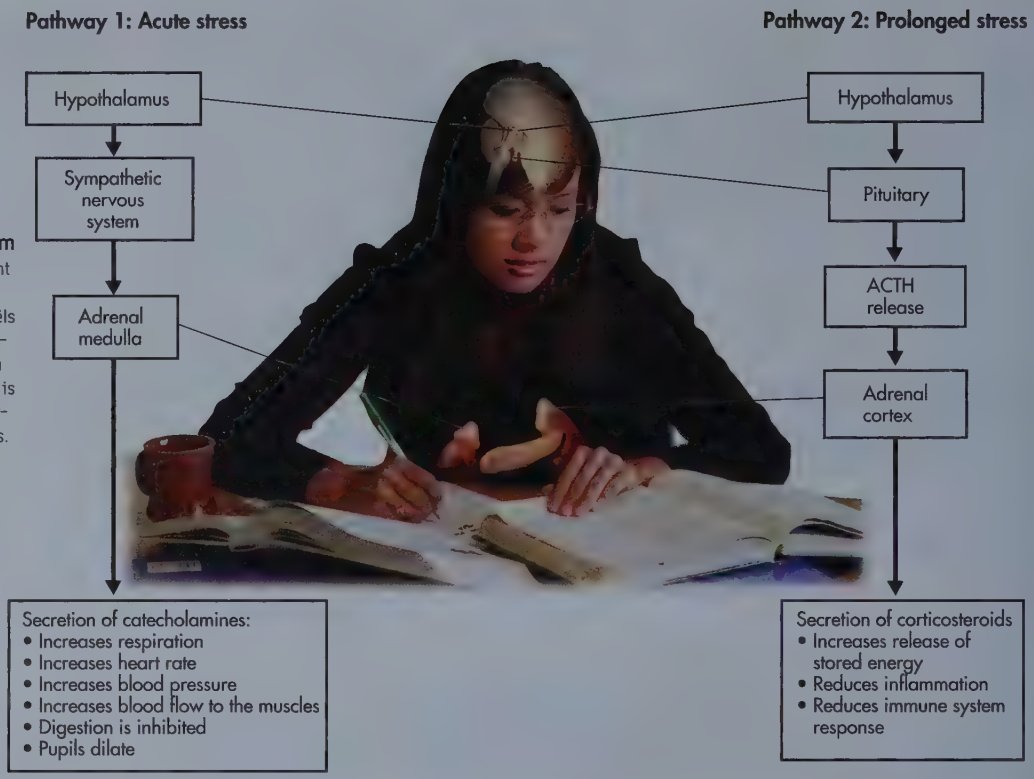


FIGURE 13.4 Endocrine System Pathways in Stress Two different endocrine system pathways are involved in the response to stress (Joëls & Baram, 2009). Walter Cannon identified the endocrine pathway shown on the left side of this diagram. This is the pathway involved in the fight-or-flight response to immediate threats. Hans Selye identified the endocrine pathway shown on the right. This second endocrine pathway plays an important role in dealing with prolonged, or chronic, stressors.

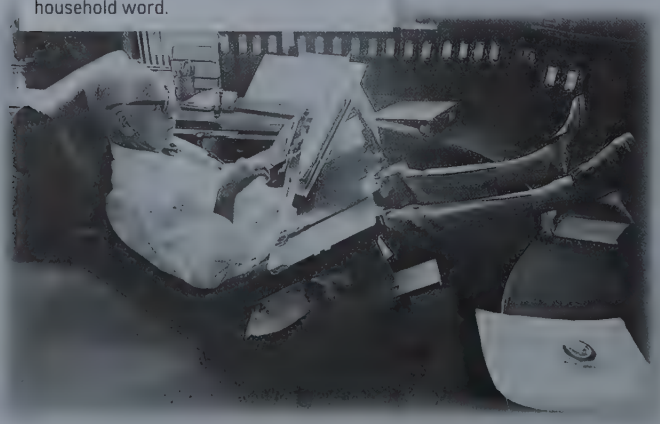
Hans Selye

Stress and the General Adaptation Syndrome

Cannon's suggestion that prolonged stress could be physically harmful was confirmed by Canadian endocrinologist **Hans Selye.** Most of Selye's pioneering research was done with rats that were exposed to prolonged stressors, such as electric shock, extreme heat or cold, or forced exercise. Regardless of the condition that Selye used to produce prolonged stress, he found the same pattern of physical changes in the rats. First, the adrenal glands became enlarged. Second, stomach ulcers and loss of weight occurred. And third, there was shrinkage of the thymus gland and lymph glands, two key components of the immune system. Selye believed that these distinct physical changes represented the essential effects of stress—the body's response to any demand placed on it.

Selye (1956, 1976) found that prolonged stress activates a second endocrine pathway (see Figure 13.4) that involves the hypothalamus, the pituitary gland, and the adrenal cortex. In response to a stressor, the hypothalamus signals the pituitary gland to secrete a hormone called *adrenocorticotropic hormone,* abbreviated *ACTH.* In turn, ACTH stimulates the adrenal cortex to release stress-related hormones called **corticosteroids,** the most important of which is *cortisol.*

In the short run, the corticosteroids provide several benefits, helping protect the body against the harm caused by stressors. For example, corticosteroids reduce inflammation of body tissues and enhance muscle tone in the heart and blood vessels. However, unlike the effects of catecholamines, which tend to diminish rather quickly, corticosteroids have long-lasting effects. If a stressor is prolonged, continued high levels of corticosteroids can weaken important body systems, lowering immunity and increasing susceptibility to physical symptoms of illness.



A Pioneer in Stress Research With his tie off and his feet up, Canadian endocrinologist Hans Selye (1907–1982) looks the picture of relaxation. Selye documented the physical effects of exposure to prolonged stress. His popular book *The Stress of Life* (1956) helped make stress a household word.

©1974 John Olson/People Weekly

Selye (1976) showed that the devastating effects of prolonged stress developed in three progressive stages, producing what he termed the **general adaptation syndrome.** These stages include:

1. *Alarm stage:* Catecholamines are released by the adrenal medulla. Intense arousal occurs, and the body mobilizes internal physical resources to meet the demands of the stress-producing event.
2. *Resistance stage:* As the body tries to adapt to the continuing stressful situation, physiological arousal lessens but remains above normal. Resistance to new stressors is impaired.
3. *Exhaustion stage:* If the stress-producing event persists, the symptoms of the alarm stage reappear, only now irreversibly. The body's energy reserves become depleted and adaptation begins to break down, leading to exhaustion, physical disorders, and, potentially, death.

Selye's description of the general adaptation syndrome firmly established some of the critical biological links between stress-producing events and their potential impact on physical health. There is mounting evidence that chronic stress can lead to increased vulnerability to acute and chronic diseases, such as cardiovascular disease (G. Miller & others, 2009). Chronic stress has also been linked to psychological problems, such as depression and anxiety (Hammen, 2005). And, as we'll see in the next section, there is new evidence explaining the link between chronic stress and premature aging.

corticosteroids (core-tick-oh-STAIR-oydz) Hormones released by the adrenal cortex that play a key role in the body's response to long-term stressors.

general adaptation syndrome Selye's term for the three-stage progression of physical changes that occur when an organism is exposed to intense and prolonged stress. The three stages are alarm, resistance, and exhaustion.

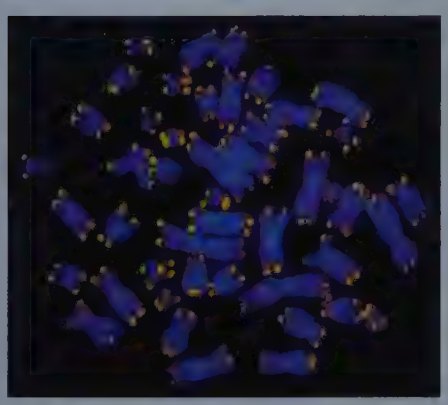
telomeres Repeated, duplicate DNA sequences that are found at the very tips of chromosomes and that protect the chromosomes' genetic data during cell division.

Stress, Chromosomes, and Aging: The Telomere Story

Diseases associated with aging and even premature aging itself have long been associated with chronic stress (Epel, 2009a; Kiecolt-Glaser & Glaser, 2010). But how might psychological stress affect physical aging?

One part of the answer may ultimately be found in the chromosomes. **Telomeres** are repeated, duplicate DNA sequences that are found at the very tips of chromosomes (see Figure 13.5). Like the plastic tips that protect shoelaces from fraying, telomeres protect the genetic data in the chromosomes from being broken or scrambled during cell division. With each cell division, the string of telomeres gets shorter. When telomeres become too short, the cell can no longer divide and may die or atrophy, causing tissue damage or loss. A growing body of literature has linked shorter telomeres with aging, age-related diseases, and mortality (Kiecolt-Glaser & Glaser, 2010; Haussman & Marchetto, 2010).

Although telomere length is roughly reflective of a cell's age, the story is not that simple. Surprisingly, telomeres can also *lengthen* in response to physiological changes (Epel, 2009b). An enzyme called *telomerase* has the capacity to add DNA to shortened telomeres, rebuilding and extending the length of telomeres (Epel & others, 2010).



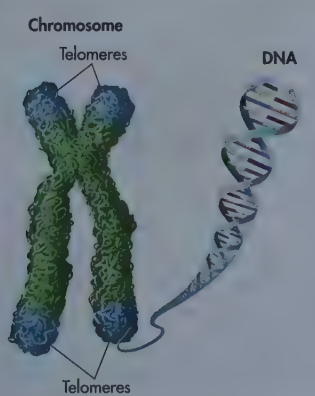


FIGURE 13.5 Telomeres As shown in the drawing on the right, *telomeres* are short, repeated DNA sequences that are found at the very tips of chromosomes (Epel, 2009b). In the photo on the left, the telomeres are the fluorescent tips on the blue-stained human chromosomes. Like the plastic tips that protect shoelaces from fraying, telomeres protect the genetic data in the chromosomes from being broken or scrambled during cell division. With each cell division, the telomeres get shorter. However, an enzyme called *telomerase* can protect and even lengthen telomeres. Psychologists today are actively studying the environmental factors that affect telomere length, including behavioral interventions that increase telomerase activity (Jacobs & others, 2011).

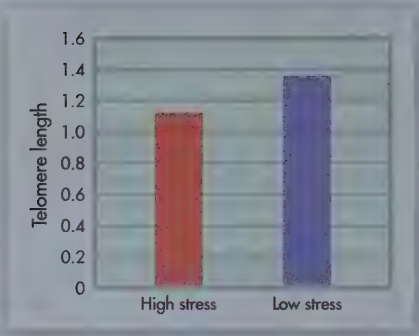


FIGURE 13.6 Perceived Stress and Telomere Length In a groundbreaking study, psychologist Elissa Epel and her colleagues (2004) compared telomere length in mothers of chronically ill children with mothers of healthy children. Even after controlling for chronological age and other biological factors, telomeres were significantly shorter in women who perceived themselves as being under a great deal of stress than in those who did not. How significant was the difference? The reduction in telomere length in the highly stressed women was roughly equivalent to more than a decade of normal aging (Epel & others, 2004).

Source: Epel & others (2004), Figure 2a, p. 17314.

Could telomeres be implicated in the link between stress and premature aging? The tentative answer seems to be *yes*. First, several studies have linked elevated levels of stress hormones cortisol and the catecholamines to shorter telomeres (see Epel, 2009b). Second, researchers have discovered that people who are under chronic stress tend to have shortened telomeres.

In a groundbreaking study that compared mothers of chronically ill children with mothers of healthy children, Elissa Epel and her colleagues (2004) found that caring for a chronically ill child was inversely associated with telomere length. That is, the longer the caregiving time, the shorter were the telomeres. Further, telomeres were shortest in mothers who perceived themselves as being under a great deal of stress, regardless of whether their children were healthy or ill (see Figure 13.6). Subsequent research has found that other stressful experiences, including a history of child abuse, depression, and caring for elderly adults with dementia, are also associated with short telomeres (Tyrka & others, 2010; Simon & others, 2006; Damjanovic & others, 2007).

A new study by Elissa Epel and colleagues (2010) provides the strongest evidence to date for a direct link between psychological stress and telomere length. Telomerase activity in "chronic-stress" older women who were caregivers for people with dementia was compared with telomerase activity in a "low-stress" matched control group. At the beginning of the study, telomerase activity was measured and found to be lower in the chronic stress women than in the low-stress women.

All of the participants were exposed to an acute laboratory stressor: Each had to deliver an impromptu speech in front of stony-faced judges and then take a math test. How did telomerase respond to acute stress? Within 90 minutes of experiencing the acute stress, telomerase activity increased by almost 20% in both groups of women. And, those participants who perceived the laboratory stressor as most threatening had the highest telomerase response (see Figure 13.7).

Epel's research is the first experimental demonstration that telomerase activity is directly affected by acute psychological stress. Acute, short-term stress produced a positive, ***adaptive*** effect on telomerase activity; chronic stress had a negative, ***maladaptive*** effect on telomerase activity.

Although research on telomeres and telomerase activity is still in its infancy, new findings suggest potential interventions that might someday be used to target telomeres to improve health and prevent age-related degenerative diseases. For example, a recent study found that vigorous physical exercise helps protect telomeres from the effects of stress (Puterman & others, 2010). Researchers are also actively investigating the impact of factors like stress management, meditation, and diet on telomeres (Epel & others, 2009; Jacobs & others, 2011; Ornish & others, 2008).

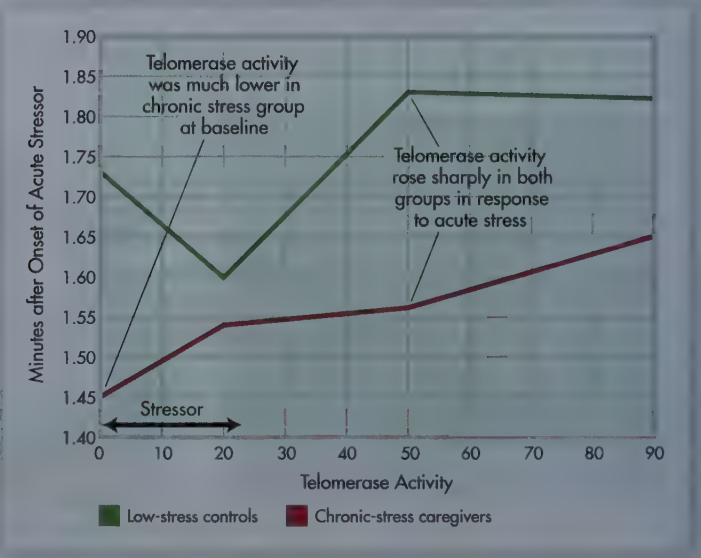
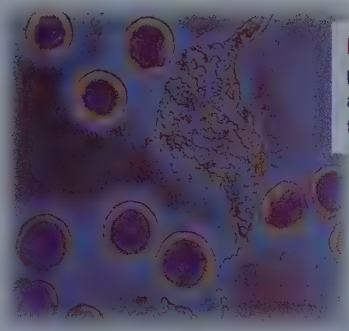


FIGURE 13.7 Effects of Chronic and Acute Stress on Telomerase Activity *Telomerase* is an enzyme that protects and lengthens telomeres. In an experiment by Elissa Epel and her colleagues (2010), telomerase activity was lower in women who were under chronic stress ("caregivers") than it was in a control group of women who were not under stress. In response to an acute stressor in the laboratory, telomerase activity rose sharply in both groups. Even at its peak, however, telomerase activity in the chronic stress group remained significantly below that of the control group.

Source: Epel & others (2010), Figure 1b.

Stress and the Immune System



Omikron/Science Source/Photo Researchers

Lymphocytes in Action This color-enhanced photo shows white blood cells, or lymphocytes, attacking and ingesting the beadlike chain of streptococcus bacteria, which can cause pneumonia.

The **immune system** is your body's surveillance system. It detects and battles foreign invaders, such as bacteria, viruses, and tumor cells. Your immune system comprises several organs, including bone marrow, the spleen, the thymus, and the lymph nodes (see Figure 13.8). The most important elements of the immune system are **lymphocytes**—the specialized white blood cells that fight bacteria, viruses, and other foreign invaders. Lymphocytes are initially manufactured in the bone marrow. From the bone marrow, they migrate to other immune system organs, such as the thymus and spleen, where they develop more fully and are stored until needed.

- **immune system** Body system that produces specialized white blood cells that protect the body from viruses, bacteria, and tumor cells.
- **lymphocytes** (LIMF-oh-sites) Specialized white blood cells that are responsible for immune defenses.
- **psychoneuroimmunology** An interdisciplinary field that studies the interconnections among psychological processes, nervous and endocrine system functions, and the immune system.

Psychoneuroimmunology

Until the 1970s, the immune system was thought to be completely independent of other body systems, including the nervous and endocrine systems. Thus, most scientists believed that psychological processes could not influence the immune system response.

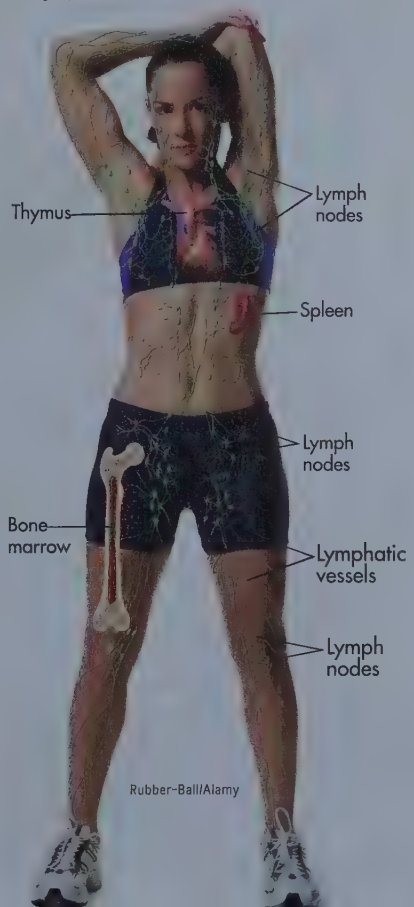
However, research in a new interdisciplinary field called *psychoneuroimmunology* helped establish that there are many interconnections among these systems, including the brain (Ader, 1993). **Psychoneuroimmunology** is the scientific study of the connections among psychological processes *(psycho-)*, the nervous system *(-neuro-)*, and the immune system *(-immunology)*.

First, the central nervous system and the immune system are *directly* linked via sympathetic nervous system fibers, which influence the production and functioning of lymphocytes.

Second, the surfaces of lymphocytes contain receptor sites for neurotransmitters and hormones, including catecholamines and cortisol. Thus, rather than operating independently, the activities of lymphocytes and the immune system are directly influenced by neurotransmitters, hormones, and other chemical messengers from the nervous and endocrine systems.

Third, psychoneuroimmunologists have discovered that lymphocytes themselves *produce* neurotransmitters and hormones. These neurotransmitters and hormones, in turn, influence the nervous and endocrine systems. In other words, there is ongoing interaction and communication among the nervous system, the endocrine system, and the immune system (Kendall-Tackett, 2010). Each system influences *and* is influenced by the other systems (Kiecolt-Glaser, 2009).

FIGURE 13.8 The Immune System Your immune system battles bacteria, viruses, and other foreign invaders that try to set up housekeeping in your body. The specialized white blood cells that fight infection are manufactured in the bone marrow and are stored in the thymus, spleen, and lymph nodes until needed.



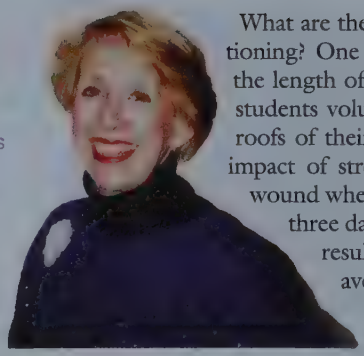
Stressors That Can Influence the Immune System

When researchers began studying how stress affects the immune system, they initially focused on extremely stressful events, such as the reentry of returning astronauts or being forced to stay awake for days (see Kiecolt-Glaser & Glaser, 1993). These highly stressful events, it turned out, were associated with reduced immune system functioning.

Subsequent research found that immune system functioning was also affected by more common stresses. For example, the stress caused by the end or disruption of important interpersonal relationships impairs immune function, putting people at greater risk for health problems (Kiecolt-Glaser & others, 2009). And perhaps not surprisingly, chronic stressors that continue for years, such as caring for a family member with Alzheimer's disease, also diminish immune system functioning (Jeckel & others, 2010). Even ordinary stressors, such as marital arguments or the pressure of exams, can adversely affect the immune system (Lester & others, 2010).

How do stressful events and negative emotions influence the immune system, and how big are the effects? This broad question has been intensely interesting to psychoneuroimmunology (PNI) researchers over the last three decades, and the consequent discoveries have substantially changed the face of health psychology.

Janice Kiecolt-Glaser, 2009



Courtesy Janice Kiecolt-Glaser

What are the practical implications of reduced immune system functioning? One consistent finding is that psychological stress increases the length of time it takes for a wound to heal. In one study, dental students volunteered to receive two small puncture wounds on the roofs of their mouths (Marucha & others, 1998). To compare the impact of stress on wound healing, the students received the first wound when they were on summer vacation and the second wound three days before their first major exam during the fall term. The results? The wounds inflicted before the major test healed an average of 40 percent more slowly—an extra three days—than the wounds inflicted on the same volunteers during summer vacation. Other studies have shown similar findings (Glaser & Kiecolt-Glaser, 2005).

What about the relationship between stress and infection? In a series of carefully controlled studies, psychologist Sheldon Cohen and his colleagues (2006) demonstrated that people who are experiencing high levels of stress are more susceptible to infection by a cold virus than people who are not under stress (see Figure 13.9). Subjects who experienced *chronic* stressors that lasted a month or longer were *most* likely to develop colds after being exposed to a cold virus. One reason may be that chronic stress triggers the secretion of corticosteroids, which affect immune system functioning. Other research has shown that stress interferes with the effectiveness of influenza vaccinations (Pedersen & others, 2009).

Health psychologists have found that a wide variety of stressors are associated with diminished immune system functioning, increasing the risk of health problems

FOCUS ON NEUROSCIENCE

The Mysterious Placebo Effect

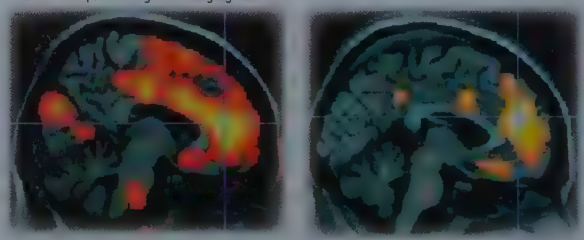
The *placebo effect* is perhaps one of the most dramatic examples of how the mind influences the body. A *placebo* is an inactive substance with no known effects, such as a sugar pill or an injection of sterile water. Placebos are often used in biomedical research to help gauge the effectiveness of an actual medication or treatment. But after being given a placebo, many research participants, including those suffering from pain or diseases, experience benefits from the placebo treatment. How can this be explained?

In Chapter 2, we noted that one possible way that placebos might reduce pain is by activating the brain's own natural painkillers—the *endorphins*. (The endorphins are structurally similar to opiate painkillers, like morphine.) One reason for believing this is that a drug called *naloxone*, which blocks the brain's endorphin response, also blocks the painkilling effects of placebos (Price & others, 2008). Might placebos reduce pain by activating the brain's natural opioid network?

A brain-imaging study by Swedish neuroscientist Predrag Petrovic and his colleagues (2002) tackled this question. In the study, painfully hot metal was placed on the back of each volunteer's hand. Each volunteer was then given an injection of either an actual opioid painkiller or a saline solution placebo. About 30 seconds later, positron emission tomography (PET) was used to scan the participants' brain activity.

Both the volunteers who received the painkilling drug *and* the volunteers who received the placebo treatment reported that the injection provided pain relief. In the two PET scans shown here, you can see that the genuine painkilling drug *(left)* and the placebo *(right)* activated the same brain area, called the *anterior cingulate cortex* (marked by the cross). The anterior cingulate cortex is known to contain many opioid receptors. Interestingly, the level of

Science, 295, 1737–1740. Petrovic, Predrag; Kalso, Eija; Petersson, Karl M.; and Ingvar, Martin. Placebo and opioid analgesia—Imaging shared neuronal network.



Received opiate painkiller **Received placebo**

brain activity was directly correlated with the participants' subjective perception of pain relief. The PET scan on the right shows the brain activity of those participants who had strong placebo responses.

Many questions remain about exactly how placebos work, but studies by Petrovic (2010) and others have substantiated the biological reality of the placebo effect. For example, Jon-Kar Zubieta and his colleagues (2005) showed that a placebo treatment activated opioid receptors in several brain regions associated with pain. Further, the greater the activation, the higher the level of pain individual volunteers were able to tolerate. As these studies show, cognitive expectations, learned associations, and emotional responses can have a profound effect on the perception of pain. Research has also demonstrated that placebos produce measurable effects on other types of brain processes, including those of people experiencing Parkinson's disease or major depression (de la Fuente-Fernández, 2009; Hunter & others, 2009).

and slowing recovery times (see Kiecolt-Glaser, 2009). However, while stress-related decreases in immune system functioning may heighten our susceptibility to health problems, exposure to stressors does not automatically translate into poorer health.

First, although prolonged, chronic stress impairs immune functioning, remember that acute, short-term stress actually enhances immune functioning (Dhabhar, 2011; Groer & others, 2010). Second, physical health is affected by the interaction of many factors, including heredity, nutrition, health-related habits, and access to medical care. Of course, your level of exposure to bacteria, viruses, and other sources of infection or disease will also influence your likelihood of becoming sick.

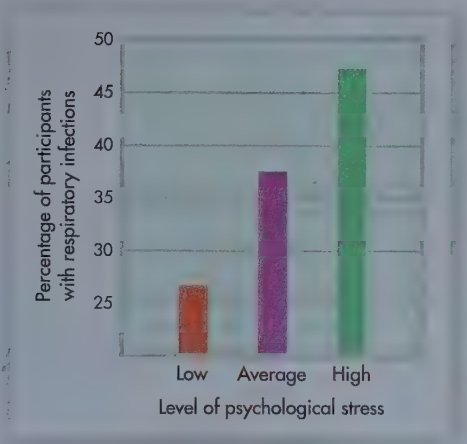


FIGURE 13.9 Stress and the Common Cold Are you more likely to catch a cold if you're under a great deal of stress? In a classic series of studies, Sheldon Cohen and his colleagues (1991, 1993) measured levels of psychological stress in healthy volunteers, then exposed them to a cold virus. They found an almost perfect relationship between the level of stress and the rate of infection. The higher the volunteers' psychological stress level, the higher the rate of respiratory infection.

Finally, the simple fact is that some people are more vulnerable to the negative effects of stress than others. Why? As you'll see in the next section, researchers have found that a wide variety of psychological factors can influence people's reactions to stressors (Pedersen & others, 2011).

CONCEPT REVIEW 13.1

Sources and Effects of Stress

Indicate whether each of the following items is true or false. Rewrite each false statement to correct it.

1. According to the biopsychosocial model, physical well-being is primarily determined by genetic factors.
2. In the past year, Andrea has gotten divorced, changed jobs, moved three times, and lost her closest friend in an auto accident. Because of the number of stress-producing life events Andrea has experienced, she is certain to develop a major illness in the next six months.
3. The level of stress due to daily hassles is measured by the Social Readjustment Rating Scale.
4. During periods of prolonged stress, the adrenal medulla secretes stress-related hormones called catecholamines.
5. Shelley's manager has just unexpectedly informed her that she is being laid off, effective immediately. Shelley is probably experiencing the exhaustion stage of the general adaptation syndrome.
6. The study of interconnections among the nervous system, immune system, endocrine system, and psychological factors is called *psychoneuroimmunology*.

Individual Factors That Influence the Response to Stress

KEY THEME

› Psychologists have identified several psychological factors that can modify an individual's response to stress and affect physical health.

KEY QUESTIONS

› How do feelings of control, explanatory style, and negative emotions influence stress and health?

› What is Type A behavior, and what role does hostility play in the relationship between Type A behavior and health?

People vary a great deal in the way they respond to a distressing event, whether it's a parking ticket or a bad grade on a crucial exam. In part, individual differences in reacting to stressors result from how people appraise an event and their resources for

■ **optimistic explanatory style** Accounting for negative events or situations with external, unstable, and specific explanations.

■ **pessimistic explanatory style** Accounting for negative events or situations with internal, stable, and global explanations.

coping with the event. However, psychologists and other researchers have identified several factors that influence an individual's response to stressful events. In this section, we'll take a look at some of the most important psychological and social factors that seem to affect an individual's response to stress.

Psychological Factors

It's easy to demonstrate the importance of psychological factors in the response to stressors. For example, sit in a crowded waiting room and watch how differently people react to news of delays or cancelled appointments. Some people take the news calmly, while others become enraged and indignant. Psychologists have confirmed what common sense suggests: Psychological processes play a key role in determining the level of stress experienced.

Personal Control

For five days the fires raged. Every night, Hawk sat in front of her friend's TV watching the news, wondering whether the house she was born in was still standing but knowing that there was absolutely nothing she could do to help protect it. Despite the nonstop coverage, there was no new information—just more images of burnt houses and flames flickering all over the mountainsides. Hawk had never felt so helpless in her entire life.

Whether it be a wildfire threatening your home or a cancelled airline flight, situations that you perceive as being beyond your control are highly stressful. In contrast, having a sense of control over a stressful situation *reduces* the impact of stressors and decreases feelings of anxiety and depression (Thompson, 2009). People who can control a stress-producing event often show no more psychological distress or physical arousal than people who are not exposed to the stressor at all.

Psychologists Judith Rodin and Ellen Langer (1977) first demonstrated the importance of a sense of control in a classic series of studies with nursing home residents. One group of residents—the "high-control" group—was given the opportunity to make choices about their daily activities and to exercise control over their environment. In contrast, residents assigned to the "low-control" group had little control over their daily activities. Decisions were made for them by the nursing home staff. Eighteen months later, the high-control residents were more active, alert, sociable, and healthier than the low-control residents. And, twice as many of the low-control residents had died (Langer & Rodin, 1976; Rodin & Langer, 1977).

How does a sense of control affect health? If you feel that you can control a stressor by taking steps to minimize or avoid it, you will experience less stress, both subjectively and physiologically (Heth & Somer, 2002; Todrank Heth & others, 2004). Having a sense of personal control also enhances positive emotions, such as self-confidence and feelings of self-efficacy, autonomy, and self-reliance. In contrast, feeling a lack of control over events produces all the hallmarks of the stress response. Levels of catecholamines and corticosteroids increase, and the effectiveness of immune system functioning decreases (see Maier & Watkins, 2000).

However, the perception of personal control in a stressful situation must be *realistic* to be adaptive (Segerstrom & Roach, 2008). Studies of people with chronic diseases, like heart disease and arthritis, have shown that unrealistic perceptions of personal control contribute to stress and poor adjustment (Affleck & others, 1987a, 1987b).

Further, not everyone benefits from feelings of enhanced personal control. Cross-cultural studies have shown that a sense of control is more highly valued in individualistic, Western cultures than in collectivistic, Eastern cultures (Thompson, 2009). Comparing Japanese and British participants, Darryl O'Connor and Mikiko Shimizu (2002) found that a heightened sense of personal control *was* associated with a lower level of perceived stress—but *only* among the British participants.

Uncontrollable Events Every morning, local authorities in Boulder, Colorado held a public information meeting for the anxious mountain residents who had been forced to evacuate their homes. Only firefighters and emergency personnel were allowed in the dangerous area where the fire was still raging. Many shared Hawk's sentiments, who said, "Not knowing whether my home was still standing or not—and not being able to do anything about it one way or the other—was the hardest part. All I could do was wait." Psychological research has shown that events and situations that are perceived as being beyond your control are especially likely to cause stress (Heth & Somer, 2002). Given that, how might you be able to lessen the stressful impact of such situations?



Cliff Grassmick / Daily Camera

Explanatory Style

Optimism Versus Pessimism

We all experience defeat, rejection, or failure at some point in our lives. Yet despite repeated failures, rejections, or defeats, some people persist in their efforts. In contrast, some people give up in the face of failure and setbacks—the essence of *learned helplessness,* which we discussed in Chapter 5. What distinguishes between those who persist and those who give up?

According to psychologist **Martin Seligman** (1990, 1992), how people characteristically explain their failures and defeats makes the difference. People who have an **optimistic explanatory style** tend to use *external, unstable,* and *specific* explanations for negative events. In contrast, people who have a **pessimistic explanatory style** use *internal, stable,* and *global* explanations for negative events. Pessimists are also inclined to believe that no amount of personal effort will improve their situation. Not surprisingly, pessimists tend to experience more stress than optimists.

Let's look at these two explanatory styles in action. Optimistic Olive sees an attractive guy at a party and starts across the room to introduce herself and strike up a conversation. As she approaches him, the guy glances at her, then abruptly turns away. Hurt by the obvious snub, Optimistic Olive retreats to the buffet table. Munching on some fried zucchini, she mulls the matter over in her mind. At the same party, Pessimistic Pete sees an attractive female across the room and approaches her. He, too, gets a cold shoulder and retreats to the chips and clam dip. Standing at opposite ends of the buffet table, here is what each of them is thinking:

OPTIMISTIC OLIVE: What's his *problem?* (External explanation: The optimist blames other people or external circumstances.)

PESSIMISTIC PETE: I must have said the wrong thing. She probably saw me stick my elbow in the clam dip before I walked over. (Internal explanation: The pessimist blames self.)

OPTIMISTIC OLIVE: I'm really not looking my best tonight. I've just got to get more sleep. (Unstable, temporary explanation)

PESSIMISTIC PETE: Let's face it, I'm a pretty boring guy and really not very good-looking. (Stable, permanent explanation)

OPTIMISTIC OLIVE: He looks pretty preoccupied. Maybe he's waiting for his girlfriend to arrive. Or his boyfriend! (Specific explanation)

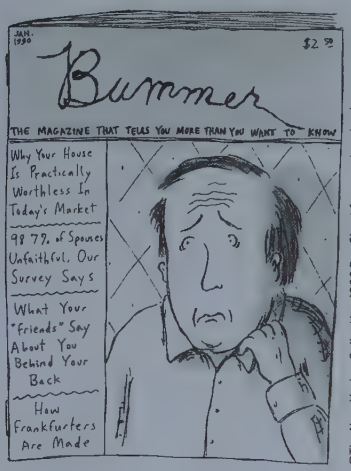
PESSIMISTIC PETE: Women never give me a second look, probably because I dress like a nerd and I never know what to say to them. (Global, pervasive explanation)

OPTIMISTIC OLIVE: Whoa! Who's that guy over there?! Okay, Olive, turn on the charm! Here goes! (Perseverance after a rejection)

PESSIMISTIC PETE: Maybe I'll just hold down this corner of the buffet table . . . or go home and soak up some TV. (Passivity and withdrawal after a rejection)

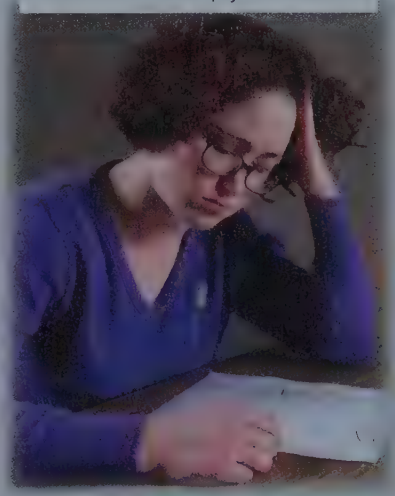
Most people, of course, are neither as completely optimistic as Olive nor as totally pessimistic as Pete. Instead, they fall somewhere along the spectrum of optimism and pessimism. Further, explanatory style may vary somewhat in different situations (Fosnaugh & others, 2009). Even so, a person's characteristic explanatory style, particularly for negative events, is relatively stable across the lifespan (Abela & others, 2008).

Explanatory style is linked to health consequences (Brummett & others, 2006; Wise & Rosqvist, 2006). For example, men with an optimistic explanatory style at age 25 were significantly healthier at age 50 than men with a pessimistic explanatory style (Peterson & Park, 2007). Other studies have shown that a pessimistic explanatory style is associated with poorer physical health (Peterson & Steen, 2009). For example, first-year law school students who had an optimistic, confident, and generally positive outlook had significantly higher levels of lymphocytes, T cells, and helper T cells. Explaining the positive relationship between optimism and good health, Suzanne Segerstrom and her colleagues (2003) suggest that optimists are more inclined to persevere in their efforts to overcome obstacles and challenges. Optimists are also more likely to cope effectively with stressful situations than pessimists (Iwanaga & others, 2004).



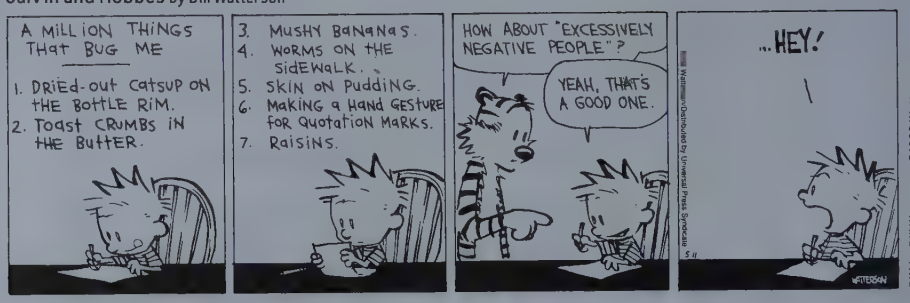
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How Do You Explain Your Setbacks and Failures? No one is thrilled to receive a failing grade on an important paper or exam. However, everyone experiences setbacks, rejection, and failure at some point. The way you *explain* your setbacks has a significant impact on motivation and on mental and physical health.



Michael Newman / Photo Edit

Calvin and Hobbes by Bill Watterson



5/11 by Bill Watterson ©1993 Watterson. Distributed by Universal Press Syndicate

Chronic Negative Emotions

The Hazards of Being Grouchy

Some people seem to have been born with a sunny, cheerful disposition. But other people almost always seem to be unhappy campers—they frequently experience bad moods and negative emotions like anger, irritability, worry, or sadness (D. J. Miller & others, 2009). Are people who are prone to chronic negative emotions more likely to suffer health problems?

Many studies have found a strong link between negative emotions and poor health (see Lahey, 2009). For example, a meta-analysis of more than 100 studies found that people who are habitually anxious, depressed, angry, or hostile *are* more likely to develop a chronic disease such as arthritis or heart disease (Friedman & Booth-Kewley, 2003).

How might chronic negative emotions predispose people to develop disease? Not surprisingly, tense, angry, and unhappy people experience more stress than do happier people. They also report more daily hassles than people who are generally in a positive mood (McIntyre & others, 2008). And, they react much more intensely, and with far greater distress, to stressful events (Lahey, 2009).

Of course, everyone occasionally experiences bad moods or has a bad day. Are these fluctuations in mood associated with health risks? Some studies suggest that even transient increases in negative mood are associated with unhealthy cardiovascular and hormone responses (Daly & others, 2010; Jacobs & others, 2007).

Positive Emotions

If negative emotions are associated with poor health, are positive emotions associated with good health? First, positive emotions are *not* just the absence of negative emotions (Larsen & others, 2009). The health benefits of experiencing positive emotions go beyond merely dampening or eliminating negative emotions.

Research has shown that positive emotions are associated with increased resistance to infection, decreased illnesses, fewer reports of illness symptoms, less pain, and longevity (Pressman & Cohen, 2005; Steptoe & others, 2009). One large Canadian study found that people who experienced high levels of positive emotion were less likely to develop heart disease than people who reported low levels of positive emotions (Davidson & others, 2010).

How might positive emotions affect health? First, positive emotions bring calming and health protective effects to the cardiovascular, endocrine, and immune systems (Brummett & others, 2009). Second, positive emotions are associated with health-promoting behaviors, such as regular exercise, eating a healthy diet, and not smoking. Finally, individuals who frequently experience positive emotions tend to have more friends and stronger social networks than people who don't (Steptoe & others, 2009).

Type A Behavior and Hostility

Type A behavior pattern A behavioral and emotional style characterized by a sense of time urgency, hostility, and competitiveness.

The concept of Type A behavior originated about 35 years ago, when two cardiologists, Meyer Friedman and Ray Rosenman (1974), noticed that many of their patients shared certain traits. The original formulation of the **Type A behavior pattern** included a cluster of three characteristics: (1) an exaggerated sense of time urgency,

often trying to do more and more in less and less time; (2) a general sense of hostility, frequently displaying anger and irritation; and (3) intense ambition and competitiveness. In contrast, people who were more relaxed and laid back were classified as displaying the *Type B behavior pattern*. After tracking the health of more than 3,000 middle-aged, healthy men, they found that those classified as Type A were twice as likely to develop heart disease as those classified as Type B. This held true even when the Type A men did not display other known risk factors for heart disease, such as smoking, high blood pressure, and elevated levels of cholesterol in their blood.



Juliet White/Getty Images

The Type A Behavior Pattern

The original formulation of the Type A behavior pattern included hostility, ambition, and a sense of time urgency. Type A people hate wasting time and often try to do two or more things at once. However, later research showed that hostility, anger, and cynicism were far more damaging to physical health than ambition or time urgency (Suls & Bunde, 2005).

Although early results linking the Type A behavior pattern to heart disease were impressive, studies soon began to appear in which Type A behavior did *not* reliably predict the development of heart disease (see Myrtek, 2007; Krantz & McCeney, 2002). These findings led researchers to question whether the different components of the Type A behavior pattern were equally hazardous to health. After all, many people thrive on hard work, especially when they enjoy their jobs. And, high achievers don't necessarily suffer from health problems.

When researchers focused on the association between heart disease and each separate component of the Type A behavior pattern—time urgency, hostility, and achievement striving—an important distinction began to emerge. Feeling a sense of time urgency and being competitive or achievement oriented did *not* seem to be associated with the development of heart disease. Instead, the critical component that emerged as the strongest predictor of cardiac disease was *hostility* (Chida & Steptoe, 2009; Williams, 2010). Hostile people are much more likely than other people to develop heart disease, even when other risk factors are taken into account (Niaura & others, 2002; Williams, 2010).

How does hostility predispose people to heart disease and other health problems? *Hostility* refers to the tendency to feel anger, annoyance, resentment, and contempt, and to hold cynical and negative beliefs about human nature in general. Hostile people are also prone to believing that the disagreeable behavior of others is intentionally directed against them. Thus, hostile people tend to be suspicious, mistrustful, cynical, and pessimistic.

Thus, hostile Type As tend to react more intensely to a stressor than other people do (Chida & Hamer, 2008). They experience greater increases in blood pressure and heart rate. Because of their attitudes and behavior, hostile men and women also tend to *create* more stress in their own lives (Suls & Bunde, 2005). They also tend to experience more frequent, and more severe, negative life events and daily hassles than other people.

In general, the research evidence demonstrating the role of personality factors in the development of stress-related disease is impressive. Nevertheless, it's important to keep this evidence in perspective: Personality characteristics are just *some* of the many factors involved in the overall picture of health and disease. We look at this issue in more detail in the Critical Thinking box on the next page. And, in Enhancing Well-Being with Psychology, at the end of this chapter, we describe some of the steps you can take to help you minimize the effects of stress on your health.

CRITICAL THINKING

Do Personality Factors Cause Disease?

- You overhear a co-worker saying, "I'm not surprised he had a heart attack—the guy is a workaholic!"
- An acquaintance casually remarks, "She's been so depressed since her divorce. No wonder she got cancer."
- A tabloid headline hails, "New Scientific Findings: Use Your Mind to Cure Cancer!"

Statements like these make health psychologists, physicians, and psychoneuroimmunologists extremely uneasy. Why? Throughout this chapter, we've presented scientific evidence that emotional states can affect the functioning of the endocrine system and the immune system. Both systems play a significant role in the development of various physical disorders. We've also shown that personality factors, such as hostility and pessimism, are associated with an increased likelihood of developing poor health. But saying that "emotions affect the immune system" is a far cry from making such claims as "a positive attitude can cure cancer."

Psychologists and other scientists are cautious in the statements they make about the connections between personality and health for several reasons. First, many studies investigating the role of psychological factors in disease are *correlational*. That is, researchers have statistical evidence that two factors happen together so often that the presence of one factor reliably predicts the occurrence of the other. However, correlation does not necessarily indicate causality—it indicates only that two factors occur together. It's completely possible that some third, unidentified factor may have caused the other two factors to occur.

Second, personality factors might indirectly lead to disease via poor health habits. Low conscientiousness, high sensation seeking, and high extraversion are each associated with poor health habits (Lodi-Smith & others, 2010; Miller & Quick, 2010; Raynor & Levine, 2009). In turn, poor health habits are associated with higher rates of illness. That's why psychologists who study the role of personality factors in disease are typically careful to measure and consider the possible influence of the participants' health practices.

Third, it may be that the disease influences a person's emotions, rather than the other way around (Spezzaferri & others, 2009). After being diagnosed with advanced cancer or heart disease, most people would probably find it difficult to feel cheerful, optimistic, or in control of their lives.



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"What do you mean, I have an ulcer? I give ulcers, I don't get them!"

One way researchers try to disentangle the relationship between personality and health is to conduct carefully controlled prospective studies. A *prospective study* starts by assessing an initially healthy group of participants on variables thought to be risk factors, such as certain personality traits. Then the researchers track the health, personal habits, health habits, and other important dimensions of the participants' lives over a period of months, years, or decades. In analyzing the results, researchers can determine the extent to which each risk factor contributed to the health or illness of the participants. Thus, prospective studies provide more compelling evidence than do correlational studies that are based on people who are already in poor health.

CRITICAL THINKING QUESTIONS

- Given that health professionals frequently advise people to change their health-related behaviors to improve physical health, should they also advise people to change their psychological attitudes, traits, and emotions? Why or why not?
- What are the advantages and disadvantages of correlational studies? Prospective studies?

CONCEPT REVIEW 13.2

Psychological Factors and Stress

Identify the psychological characteristic that is best illustrated by each of the examples below. Choose from the following:

a. high level of personal control
b. optimistic explanatory style
c. Type A behavior pattern
d. Type B behavior pattern
e. pessimistic explanatory style
f. chronic negative emotions

1. No matter what happens to her, Lucy is dissatisfied and grumpy. She constantly complains about her health, her job, and how awful her life is. She dislikes most of the people she meets.
2. Cheryl was despondent when she received a low grade on her algebra test. She said, "I will never do well on exams because I'm not very smart. I might as well drop out of school now before I flunk out."
3. In order to deal with the high levels of stress associated with returning to college full-time, Pat selected her courses carefully, arranged her work and study schedules to make the best use of her time, and scheduled time for daily exercise and social activities.
4. Richard is a very competitive, ambitious stockbroker who is easily irritated by small inconveniences. If he thinks that someone is wasting his time, he blows up and becomes completely enraged.
5. Max flubbed an easy free throw in the big basketball game but told his coach, "My game was off today because I'm still getting over the flu and I pulled a muscle in practice yesterday. I'll do better in next week's game."

Social Factors: A Little Help from Your Friends

social support The resources provided by other people in times of need.

KEY THEME

› Social support refers to the resources provided by other people.

KEY QUESTIONS

› How has social support been shown to benefit health?

› How can relationships and social connections sometimes increase stress?

› What gender differences have been found in social support and its effects?

Psychologists have become increasingly aware of the importance that close relationships play in our ability to deal with stressors and, ultimately, in our physical health (Uchino & Birmingham, 2011). Consider the following research evidence:

- Analyzing 148 studies that included over 300,000 participants, Julianne Holt-Lundstad and her colleagues (2010) found that people who were socially isolated were twice as likely to die over a given period than people with strong social relationships—a risk factor that is roughly equivalent to smoking 15 cigarettes a day.
- Decades of research have conclusively shown that loneliness, especially chronic loneliness, predicts poorer physical and mental health, higher death rates, and decreased cognitive functioning (Hawkley & Cacioppo, 2010).
- In a study begun in the 1950s, college students rated their parents' level of love and caring. A half-century later, 87 percent of those who had rated their parents as being "low" in love and caring had been diagnosed with a serious physical disease. In contrast, only 25 percent of those who had rated their parents as being "high" in love and caring had been diagnosed with a serious physical disease (Shaw & others, 2004).

These are just a few of the hundreds of studies exploring how interpersonal relationships influence our health and ability to tolerate stress (Cohen, 2004; Uchino, 2009). To investigate the role played by personal relationships in stress and health, psychologists measure the level of **social support**—the resources provided by other people in times of need.

Decades of psychological research have shown that socially isolated people have poorer health and higher death rates than people who have many social contacts or relationships. In fact, social isolation seems to be as potent a health risk as smoking, alcohol abuse, obesity, or physical inactivity (Holt-Lunstad & others, 2010).

Beyond social isolation, researchers have found that the more *diverse* your social network, the more pronounced the health benefits (Cohen & Janicki-Deverts, 2009). That is, prospective studies have shown that the people who live longest are those who have more *different types* of relationships—such as being married; having close relationships with family members, friends, and neighbors; and belonging to social, political, or religious groups (Berkman & Glass, 2000). In fact, researchers have found that people who live in such diverse social networks have:

- greater resistance to upper respiratory infections (Cohen, 2005)
- lower incidence of stroke and cardiovascular disease among women in a high-risk group (Rutledge & others, 2004, 2008)
- lower incidence of dementia and cognitive loss in old age (Desai & others, 2010)

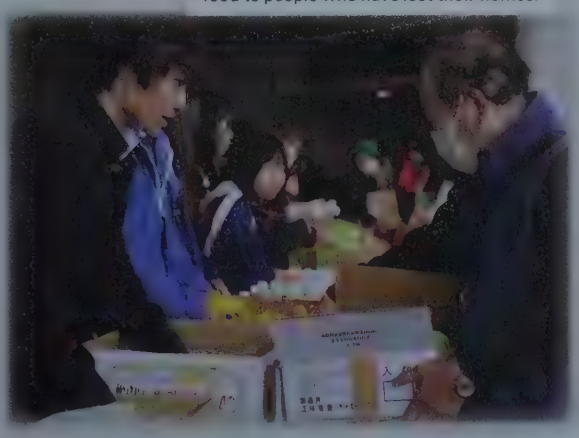


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"I'm somewhere between O. and K."

The Benefits of Social Support

Social support from your community can buffer the effects of stress, especially during natural disasters. People around the world were amazed at the calm, orderly, and cooperative response of Japanese citizens in the face of widespread devastation after the March 2011 earthquake and tsunami. The cultural traditions of cooperation and social harmony in this collectivistic society may have contributed to their resilient behavior in the face of so much destruction (Kelts, 2011). Here, high school volunteers help distribute food to people who have lost their homes.



Yusuke Nakanishi/AFLO/ZUMAPRESS.com

How Social Support Benefits Health

Social support may benefit our health and improve our ability to cope with stressors in several ways (Uchino, 2009). First, the social support of friends and relatives can modify our appraisal of a stressor's significance, including the degree to which we perceive it as threatening or harmful. Simply knowing that support and assistance are readily available may make the situation seem less threatening.

Second, the presence of supportive others seems to decrease the intensity of physical reactions to a stressor (Uchino & others, 2010).



Joe Carini/The Image Works

Pets as a Source of Social Support Pets can provide both companionship and social support, especially for people with limited social contact. Studies have found that the presence of a pet cat or dog can lower blood pressure and lessen the cardiovascular response to acute stress (Allen & others, 2002).

Thus, when faced with a painful medical procedure or some other stressful situation, many people find the presence of a supportive friend to be calming.

Third, social support can influence our health by making us less likely to experience negative emotions (Cohen, 2004). Given the well-established link between chronic negative emotions and poor health, a strong social support network can promote positive moods and emotions, enhance self-esteem, and increase feelings of personal control. In contrast, loneliness and depression are unpleasant emotional states that increase levels of stress hormones and adversely affect immune system functioning (Irwin & Miller, 2007).

The flip side of the coin is that relationships with others can also be a significant *source* of stress (Rook & others, 2011). In fact, negative interactions with other people are sometimes more effective at creating psychological distress than positive interactions are at improving well-being (Rafaeli & others, 2008). And, although married people tend to be healthier than unmarried people overall, marital conflict has been shown to have adverse effects on physical health, especially for women (Whisman & others, 2010).

Clearly, the quality of interpersonal relationships is an important determinant of whether those relationships help or hinder our ability to cope with stressful events. When other people are perceived as being judgmental, their presence may increase the individual's physical reaction to a stressor. In two clever studies, psychologist Karen Allen and her colleagues (1991, 2002) demonstrated that the presence of a favorite dog or cat was more effective than the presence of a spouse or friend in lowering reactivity to a stressor. Why? Perhaps because the pet was perceived as being nonjudgmental, non-evaluative, and unconditionally supportive. Unfortunately, the same is not always true of friends, family members, and partners.

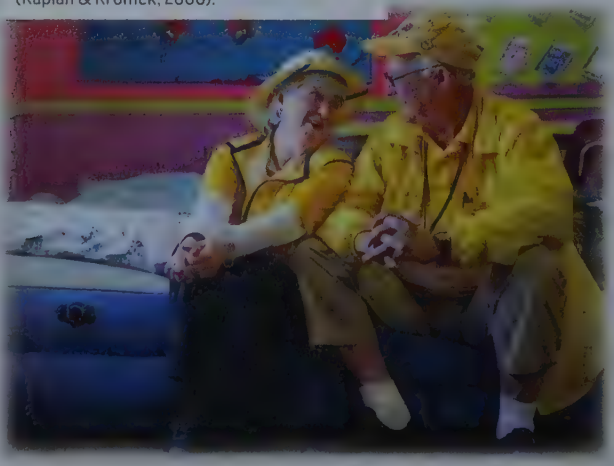
Stress may also increase when well-meaning friends or family members offer unwanted or inappropriate social support. The In Focus box offers some suggestions on how to provide helpful social support and avoid inappropriate support behaviors.

Gender Differences in the Effects of Social Support

Who do you turn to when you are in need of help? In general, men tend to rely heavily on a close relationship with their spouse or partner. Women, in contrast, are more likely to list close friends along with their spouse as confidants (Ackerman & others, 2007; Coventry & others, 2004). Because men tend to have a much smaller network of intimate others, they may be particularly vulnerable to social isolation, especially if their spouse dies. That may be one reason that the health benefits of being married are more pronounced for men than for women (Zwicker & DeLongis, 2010).

When stressful events strike, women tend to reach out to one another for support and comfort (Taylor & Master, 2011). For example, Andi's many friends rallied around her when she returned to Boulder, helping her find a place to live, and bringing food and groceries to her rental cottage. And, rather than face her burned-out home for the first time alone, Andi recruited your author Sandy and a few other close friends to go with her.

The Health Benefits of Companionship Marteen and Wiley Blankenship celebrated their 48th wedding anniversary by working as volunteers in Alabama, helping people in a small town devastated by a violent tornado. Many studies have shown that couples and married people tend to live longer than people who are single, divorced, or widowed. In fact, adults who never marry are about 58% more likely to die early than those who are married and living with their spouse (Kaplan & Kronick, 2006).



RICH ADDICKS/The New York Times/Redux

On the other hand, women can be particularly vulnerable to some of the problematic aspects of social support, for a couple of reasons. First, women are more likely than men to serve as *providers* of support, which can be a very stressful role (Ekwall & Hallberg, 2007).

Second, women may be more likely to suffer from the *stress contagion effect*, becoming upset about negative life events that happen to other people whom they care about (Dalgard & others, 2006). Since women tend to have larger and more intimate social networks than men, they have more opportunities to become distressed by what happens to people who are close to them. And women are more likely than men to be upset about negative events that happen to their relatives and friends. In contrast, men are more likely to be distressed only by negative events that happen to their immediate family—their wives and children (Rosenfield & Smith, 2010).

IN FOCUS

Providing Effective Social Support

A close friend turns to you for help in a time of crisis or personal tragedy. What should you do or say? As we've noted in this chapter, appropriate social support can help people weather crises and can significantly reduce the amount of distress that they feel. Inappropriate support, in contrast, may only make matters worse (Uchino, 2009).

Researchers generally agree that there are several broad categories of social support. Three are most commonly studied: emotional, tangible, and informational. Each provides different beneficial functions (Lett & others, 2009).

Emotional support includes expressions of concern, empathy, and positive regard. *Tangible support* involves direct assistance, such as providing transportation, lending money, or helping with meals, child care, or household tasks. When people offer helpful suggestions, advice, or possible resources, they are providing *informational support.*

It's possible that all three kinds of social support might be provided by the same person, such as a relative, spouse, or very close friend. More commonly, we turn to different people for different kinds of support (Masters & others, 2007).

Psychologists have identified several support behaviors that are typically perceived as helpful by people under stress (Goldsmith, 2004; Hobfoll, 1992). In a nutshell, you're most likely to be perceived as helpful if you:

- are a good listener and show concern and interest
- ask questions that encourage the person under stress to express his or her feelings and emotions
- express understanding about why the person is upset
- express affection for the person, whether with a warm hug or simply a pat on the arm
- are willing to invest time and attention in helping
- can help the person with practical tasks, such as housework, transportation, or responsibilities at work or school

Just as important is knowing what *not* to do or say. Here are several behaviors that, however well intentioned, are often perceived as unhelpful:

- Giving advice that the person under stress has not requested
- Telling the person, "I know exactly how you feel." It's a mistake to think that you have experienced distress identical to what the other person is experiencing



Andrew Hobbs/Getty Images

- Talking about yourself or your own problems
- Minimizing the importance of the person's problem by saying things like, "Hey, don't make such a big deal out of it," "It could be a lot worse," or "Don't worry, everything will turn out okay"
- Joking or acting overly cheerful
- Offering your philosophical or religious interpretation of the stressful event by saying things like, "It's fate," "It's God's will," or "It's your karma"
- Making a big deal out of the support and help you do provide, which may make the recipient feel even more anxious or vulnerable. In fact, "invisible support," in which the recipient isn't aware of your help, is one of the most effective forms of social support (Bolger & Amarel, 2007; Howland & Simpson, 2010). For example, asking a question in class because you know that a classmate doesn't understand the material would be an example of invisible support.

Finally, remember that although social support is helpful, it is *not* a substitute for counseling or psychotherapy. If a friend seems overwhelmed by problems or emotions, or is having serious difficulty handling the demands of everyday life, you should encourage him or her to seek professional help. Most college campuses have a counseling center or a health clinic that can provide referrals to qualified mental health workers. Sliding fee schedules, based on ability to pay, are usually available. Thus, you can assure the person that cost need not be an obstacle to getting help—or an additional source of stress!

Coping: How People Deal with Stress

KEY THEME

› Coping refers to the ways in which we try to change circumstances, or our interpretation of circumstances, to make them less threatening.

KEY QUESTIONS

› What are the two basic forms of coping, and when is each form typically used?

› What are some of the most common coping strategies?

› How does culture affect coping style?

Think about some of the stressful periods that have occurred in your life. What kinds of strategies did you use to deal with those distressing events? Which strategies seemed to work best? Did any of the strategies end up working against your ability



Ben Sklar/The New York Times/Redux

Ways of Coping Like the stress response itself, adaptive coping is a dynamic and complex process. Imagine that your landlord told you that you had to move in 10 days. What types of coping strategies might prove most helpful?

to reduce the stressor? If you had to deal with the same events again today, would you do anything differently?

For example, imagine that you discovered that you weren't allowed to register for classes because the financial aid office had misfiled your paperwork. How would you react? What would you do?

The strategies that you use to deal with distressing events are examples of coping. **Coping** refers to the ways in which we try to change circumstances, or our interpretation of circumstances, to make them more favorable and less threatening (Folkman, 2009).

Adaptive coping is a dynamic and complex process (Carver, 2011). We may switch our coping strategies as we appraise the changing demands of a stressful situation and our available resources at any given moment. We also evaluate whether our efforts have made a stressful situation better or worse and adjust our coping strategies accordingly.

When coping is effective, we adapt to the situation and stress is reduced. Unfortunately, coping efforts do not always help us adapt. Maladaptive coping can involve thoughts and behaviors that intensify or prolong distress, or that produce self-defeating outcomes (Thompson & others, 2010). The rejected lover who continually dwells on his former companion, passing up opportunities to form new relationships and letting his studies slide, is demonstrating maladaptive coping.

Adaptive coping responses serve many functions (Folkman & Moskowitz, 2007; Folkman, 2009). Most important, adaptive coping involves realistically evaluating the situation and determining what can be done to minimize the impact of the stressor. But adaptive coping also involves dealing with the emotional aspects of the situation. In other words, adaptive coping often includes developing emotional tolerance for negative life events, maintaining self-esteem, and keeping emotions in balance. Finally, adaptive coping efforts are directed toward preserving important relationships.

Traditionally, coping has been broken down into two major categories—*problem-focused* and *emotion-focused* (Folkman & Moskowitz, 2004). As you'll see in the next sections, each type of coping serves a different purpose. However, people are flexible in the coping styles they adopt, often relying on different coping strategies for different stressors (Kammeyer-Mueller & others, 2009).

Problem-Focused and Emotion-Focused Coping Strategies Dealing with the devastation that follows major disasters requires multiple coping strategies. Along with coping with the emotional impact of losing loved ones in the March, 2011 earthquake and tsunami that hit Japan, this couple must also call upon problem-focused coping to salvage what they can from their destroyed home.



Paula Bronstein/Getty Images

Problem-Focused Coping Strategies

Changing the Stressor

Problem-focused coping is aimed at managing or changing a threatening or harmful stressor. Problem-focused coping strategies tend to be most effective when you can exercise some control over the stressful situation or circumstances (Kammeyer-Mueller & others, 2009; Park & others, 2004).

Our friend Wyncia, whose own house narrowly escaped the flames, demonstrated the value of problem-focused coping. A member of the volunteer fire department, she received the call to mobilize just minutes after she saw the thick cloud of black smoke and realized that the fire was nearby. Grabbing her emergency kit, Wyncia raced to the fire station, leaving her husband to pack up their dog and whatever else he could hurriedly stuff into their car as the flames drew near.

Wyncia said, "When you experience that gut 'fight-or-flight reaction,' and there's no one to fight, and nowhere to run, you just melt down. But when you're with the fire department, instead of melting down, you get up and do your job. Joining the fire department as a volunteer was the best thing I could have done. Instead of just sitting at the bottom of the hill and waiting for news, and looking at the horrible smoke and wondering whether my house was still there, I was actually involved with the people who were working on the problem. I was doing something about it."

Planful problem solving involves efforts to rationally analyze the situation, identify potential solutions, and then implement them. In

IN FOCUS

Gender Differences in Responding to Stress: "Tend-and-Befriend" or "Fight-or-Flight"?

Physiologically, men and women show the same hormonal and sympathetic nervous system activation that Walter Cannon described as the "fight-or-flight" response to stress (1932). Yet *behaviorally*, the two sexes react very differently.

To illustrate, consider this finding: When men come home after a stressful day at work, they tend to withdraw from their families, wanting to be left alone—an example of the "flight" response (Repetti & others, 2009). After a stressful workday, however, women tend to seek out interactions with their marital partners (Schulz & others, 2004). And, women tend to be more nurturing toward their children, rather than less (Campos & others, 2009).

As we have noted in this chapter, women tend to be much more involved in their social networks than men. And, as compared to men, women are much more likely to seek out and use social support when they are under stress. Throughout their lives, women tend to mobilize social support—especially from other women—in times of stress (Zwicker & DeLongis, 2010).

Why the gender difference in coping with stress? Health psychologists Shelley Taylor and her colleagues (2000; Taylor & Gonzaga, 2007) believe that evolutionary theory offers some insight. According to the evolutionary perspective, the most adaptive response in virtually any situation is one that promotes the survival of both the individual and the individual's offspring (Taylor & Masters, 2011). Given that premise, neither fighting nor fleeing is likely to have been an adaptive response for females, especially females who were pregnant, nursing, or caring for their offspring. According to Taylor (2006), "Tending to offspring in times of stress would be vital to ensuring the survival of the species." Rather than fighting or fleeing, they argue, women developed a *tend-and-befriend* behavioral response to stress.

What is the "tend-and-befriend" pattern of responding? *Tending* refers to "quieting and caring for offspring and blending into the environment," Taylor and her colleagues (2000) write. That is, rather than confronting or running from the threat, females take cover and protect their young. Evidence supporting this behavior pattern includes studies showing that many female animals adopt a "tending" strategy when faced by a threat (Taylor, 2006; Trainor & others, 2010).

The "befriending" side of the equation relates to women's tendency to seek social support during stressful situations. *Befriending* is the creation and maintenance of social networks that provide resources and protection for the female and her offspring under conditions of stress (Taylor & Master, 2011).

However, both males and females show the same neuroendocrine responses to an acute stressor—the sympathetic nervous system activates, stress hormones pour into the bloodstream, and, as those hormones reach different organs, the body kicks into high gear. So why do women "tend and befriend" rather than "fight or flee," as men do? Taylor points to the effects of another hormone, *oxytocin*. Higher in females than in males, oxytocin is associated with maternal behaviors in all female mammals, including humans. Oxytocin also tends to have a calming effect on both males and females (see Southwick & others, 2005).

Taylor speculates that oxytocin might simultaneously help calm stressed females and promote affiliative behavior. Supporting this speculation is research showing that oxytocin increases affiliative behaviors and reduces stress in many mammals (Taylor & Master, 2011). For example, one study found that healthy men who received a dose of oxytocin before being subjected to a stressful procedure were less anxious and had lower cortisol levels than men who received a placebo (Heinrichs & others, 2003).

In humans, oxytocin is highest in nursing mothers. Pleasant physical contact, such as hugging, cuddling, and touching, stimulates the release of oxytocin. In combination, all of these oxytocin-related changes seem to help turn down the physiological intensity of the fight-or-flight response for women. And perhaps, Taylor suggests, they also promote the tend-and-befriend response.

effect, you take the attitude that the stressor represents a problem to be solved. Once you assume that mental stance, you follow the basic steps of problem solving (see Chapter 7).

When people use aggressive or risky efforts to change the situation, they are engaging in *confrontive coping*. Ideally, confrontive coping is direct and assertive without being hostile. When it is hostile or aggressive, confrontive coping may well generate negative emotions in the people being confronted, damaging future relations with them (Folkman & Lazarus, 1991). If you recall our earlier discussion of hostility, then you won't be surprised to find that hostile individuals engage often in confrontive coping (Vandervoort, 2006).

Emotion-Focused Coping Strategies

Changing Your Reaction to the Stressor

When the stressor is one over which we can exert little or no control, we often focus on the dimension of the situation that we *can* control—the emotional impact of the stressor on us. When people think that nothing can be done to alter a situation, they tend to rely on **emotion-focused coping.** They direct their efforts toward relieving or regulating the emotional impact of the stressful situation (Scott & others, 2010). Although emotion-focused coping doesn't change the problem, it can help you feel better about it.

When you shift your attention away from the stressor and toward other activities, you're engaging in the emotion-focused coping strategy called *escape–avoidance*. As the name implies, the basic goal is to escape or avoid the stressor and neutralize distressing

coping Behavioral and cognitive responses used to deal with stressors; involves our efforts to change circumstances, or our interpretation of circumstances, to make them more favorable and less threatening.

problem-focused coping Coping efforts primarily aimed at directly changing or managing a threatening or harmful stressor.

emotion-focused coping Coping efforts primarily aimed at relieving or regulating the emotional impact of a stressful situation.



Cathy Steiner

Coping Through Humor: Everybody Say "Argh!" Humor is one helpful way to distance yourself, at least temporarily, from the emotional impact of a difficult situation. As we planned our trip to Andi's burned-out home to see what might be salvaged, Andi joked that we would be like a band of pirates looking for buried treasure. But the house was completely destroyed—there was to be no loot for these pirates. Laughing through tears, Andi led us in a rousing chorus of "Argh!" and then bravely planted the pirate flag on the only thing left standing—her charred exercycle.

emotions. Excessive sleeping and the use of drugs and alcohol are maladaptive forms of escape–avoidance, as are escaping into fantasy or wishful thinking. More constructive escape–avoidance strategies include exercising or immersing yourself in your studies, hobbies, or work.

Because you are focusing your attention on something other than the stressor, escape–avoidance tactics provide emotional relief in the short run. Thus, avoidance strategies can be helpful when you are facing a stressor that is brief and has limited consequences. But avoidance strategies such as wishful thinking tend to be counterproductive when the stressor is a severe or long-lasting one, like a serious or chronic disease (Wolf & Mori, 2009).

In the long run, escape–avoidance tactics are associated with poor adjustment and symptoms of depression and anxiety (Murberg & Bru, 2005). That's not surprising if you think about it. After all, the problem *is* still there. And if the problem is one that needs to be dealt with promptly, such as academic problems, the delays caused by escape–avoidance strategies can make the stressful situation worse.

Seeking social support is the coping strategy that involves turning to friends, relatives, or other people for emotional, tangible, or informational support. As we discussed earlier in the chapter, having a strong network of social support can help buffer the impact of stressors (Uchino, 2009). Confiding in a trusted friend gives you an opportunity to vent your emotions and better understand the stressful situation.

When you acknowledge the stressor but attempt to minimize or eliminate its emotional impact, you're engaging in the coping strategy called *distancing*. Having an attitude of joy and lightheartedness in daily life, and finding the humor in life's absurdities or ironies, is one form of distancing (Kuhn & others, 2010). Sometimes people emotionally distance themselves from a stressor by discussing it in a detached, depersonalized, or intellectual way.

For example, when Andi planned her first trip up to her burned-out house to see what could be salvaged, she joked that we would be like pirates looking for booty in the wreckage. The admittedly silly joke caught on. Along with the pile of donated shovels, rakes, screens, face masks and heavy work gloves, one friend brought a hand-made pirate flag and another a stuffed parrot! When we got to Andi's home-site, she planted the flag on top of the only item of furniture that was still standing—her charred exercise bicycle.

In certain high-stress occupations, distancing can help workers cope with painful human problems. Clinical psychologists, social workers, rescue workers, police officers, and medical personnel often use distancing to some degree to help them deal with distressing situations without falling apart emotionally themselves.

In contrast to distancing, *denial* is a refusal to acknowledge that the problem even exists. Like escape–avoidance strategies, denial can compound problems in situations that require immediate attention.

Perhaps the most constructive emotion-focused coping strategy is *positive reappraisal*. When we use positive reappraisal, we try not only to minimize the negative emotional aspects of the situation but also to create positive meaning by focusing on personal growth (Folkman, 2009). Even in the midst of deeply disturbing situations, positive reappraisal can help people experience positive emotions and minimize the potential for negative aftereffects (Weiss & Berger, 2010).

Positive Reappraisal: Transcending Tragedy Model Petra Nemcova was vacationing with her fiancé when a tsunami struck Thailand. Swept up in the powerful currents of debris and destruction, Nemcova lost sight of her fiancé in the swirling waters but managed to grab hold of a partly submerged palm tree. Suffering from a shattered pelvis and internal injuries, Nemcova clung to the tree for eight hours before being rescued. Three months later, her fiance's body was found.

Nemcova founded Happy Hearts Fund, an international foundation that has raised tens of millions of dollars and founded schools and clinics in areas hit by natural disasters around the world, including Thailand, Sri Lanka, Pakistan, Cambodia, and Vietnam. Nemcova is shown here at the opening of a kindergarten in an Indonesian village that was devastated by a powerful earthquake.



APPhotoIPurwowiyoto

For example, as Andi said, "Your life is terrible and wonderful at the same time. It's terrible because you've lost everything you own. But it's wonderful because you see the incredible kindness of strangers."

Some people turn to their religious or spiritual beliefs to help them cope with stress. *Positive religious coping* includes seeking comfort or reassurance in prayer, a religious community, or believing that your personal

experience is spiritually meaningful. Positive religious coping is generally associated with lower levels of stress and anxiety, improved mental and physical health, and enhanced well-being (Ano & Vasconcelles, 2005).

On the other hand, religious beliefs can also lead to a less positive outcome. Individuals who respond with *negative religious coping,* in which they become angry, question their religious beliefs, or believe that they are being punished, tend to experience increased levels of distress, poorer health, and decreased well-being (Smith & others, 2005; Ano & Vasconcelles, 2005).

For many people, religious coping offers a sense of control or certainty during stressful events or circumstances (Hogg & others, 2010; Kay & others, 2010). For example, some people find strength in the notion that adversity is a test of their religious faith or that they have been given a particular challenge in order to fulfill a higher moral purpose. Religious beliefs and practices help some people feel more optimistic or hopeful during stressful times. For some people, religious or spiritual beliefs can increase resilience, optimism, and personal growth during times of stress and adversity (Pargament & Cummings, 2010).

Finally, it's important to note that there is no single "best" coping strategy. In general, the most effective coping is flexible, meaning that we fine-tune our coping strategies to meet the demands of a particular stressor (Carver, 2011; Cheng, 2009). And, people often use multiple coping strategies, combining problem-focused and emotion-focused forms of coping. In the initial stages of a stressful experience, we may rely on emotion-focused strategies to help us step back emotionally from a problem. Once we've regained our equilibrium, we may use problem-focused coping strategies to identify potential solutions.

Although it's virtually inevitable that you'll encounter stressful circumstances, there are coping strategies that can help you minimize their health effects. We suggest several techniques in the Enhancing Well-Being with Psychology section at the end of the chapter.

Culture and Coping Strategies

Culture can influence the choice of coping strategies (Chun & others, 2006). Americans and other members of individualistic cultures tend to emphasize personal autonomy and personal responsibility in dealing with problems. Thus, they are *less* likely to seek social support in stressful situations than are members of collectivistic cultures, such as Asian cultures (Wong & Wong, 2006). Members of collectivistic cultures tend to be more oriented toward their social group, family, or community and toward seeking help with their problems.

Individualists also tend to emphasize the importance and value of exerting control over their circumstances, especially circumstances that are threatening or stressful (O'Connor & Shimizu, 2002). Thus, they favor problem-focused strategies, such as confrontive coping and planful problem solving. These strategies involve directly changing the situation to achieve a better fit with their wishes or goals (Wong & Wong, 2006).

In collectivistic cultures, however, a greater emphasis is placed on controlling your personal reactions to a stressful situation rather than trying to control the situation itself. According to some researchers, people in China, Japan, and other Asian cultures are more likely to rely on emotional coping strategies than people in individualistic cultures. Coping strategies that are particularly valued in collectivistic cultures include emotional self-control, gracefully accepting one's fate and making the best of a bad situation, and maintaining harmonious relationships with family members (Heppner, 2008; Yeh & others, 2006). This emotion-focused coping style emphasizes gaining control over inner feelings by accepting and accommodating yourself to existing realities (O'Connor & Shimizu, 2002).

For example, the Japanese emphasize accepting difficult situations with maturity, serenity, and flexibility (Gross, 2007). Common sayings in Japan are "The true tolerance is to tolerate the intolerable" and "Flexibility can control rigidity." Along with controlling inner feelings, many Asian cultures also stress the goal of controlling the outward expression of emotions, however distressing the situation (Park, 2010).

Culture and Coping This young boy lost his legs in a devastating earthquake that killed almost 100,000 people in southwest China. Do coping strategies differ across cultures? According to some researchers, people in China, Japan, and other Asian cultures are more likely to rely on emotional coping strategies than people in individualistic cultures (Heppner, 2008; Yeh & others, 2006). Coping strategies that are particularly valued in collectivistic cultures include emotional self-control, gracefully accepting one's fate and making the best of a bad situation, and maintaining harmonious relationships with family members (Heppner, 2008; Yeh & others, 2006).



Imaginechina via AP Images

These cultural differences in coping underscore the point that there is no formula for effective coping in all situations. That we use multiple coping strategies throughout almost every stressful situation reflects our efforts to identify what will work best at a given moment in time. To the extent that any coping strategy helps us identify realistic alternatives, manage our emotions, and maintain important relationships, it is adaptive and effective.

CONCEPT REVIEW 13.3

Psychological Factors and Stress Coping Strategies

Identify the coping strategy that is being illustrated in each of the scenarios below. Choose from:

a. confrontive coping
b. planful problem solving
c. escape-avoidance
d. seeking social support
e. distancing
f. denial
g. positive reappraisal

1. In trying to contend with her stormy marriage, Emily often seeks the advice of her best friend, Caitlin.
2. Lionel was disappointed that he did not get the job, but he concluded that the knowledge he gained from the application and interview process was very beneficial.
3. Whenever Dr. Mathau has a particularly hectic and stressful shift in the emergency room, she finds herself making jokes and facetious remarks to the other staff members.
4. Jake's job as a public defender is filled with long days and little thanks. To take his mind off his job, Jake jogs every day.
5. Faced with low productivity and mounting financial losses, the factory manager bluntly told all his workers, "You people had better start getting more work done in less time, or you will be looking for jobs elsewhere."
6. After spending several days in the hospital with a family member who was seriously injured in a motorcycle accident, Chris did very poorly on his last two tests and was very concerned about his GPA. Chris decided to talk with his professor about the possibility of writing an extra paper or taking a makeup exam.
7. Although she failed her midterm exam and got a D on her term paper, Olivia insists that she is going to get a B in her economics course.

■ **mindfulness meditation** A technique in which practitioners focus *awareness* on *present experience* with *acceptance*.



CLOSING THOUGHTS

From disasters and major life events to the minor hassles and annoyances of daily life, stressors come in all sizes and shapes. Stress is an unavoidable part of life. If prolonged or intense, stress can adversely affect both our physical and psychological well-being. Fortunately, most of the time people deal effectively with the stresses in their lives. But effective coping can minimize the effects of even the most intense stressors, like losing your home in a fire.

The Poetry of Loss: Making Meaning from Tragedy Andi had never thought of herself as a writer. However, facing the loss of everything she owned, she wrote long emails to her large networks of friends. The emails turned into essays, which turned into a blog, www.burningdownthehouseblog.com. Through her blog, Andi shares her experiences with hundreds of readers on what she calls "the poetry of loss." Despite the pain and the anger, Andi says, there is a new sense of "wonder, and exploration, and learning, and excitement"—the "terrible gift" of great loss (O'Conor, 2011).



Greg Lefcourt

Ultimately, the level of stress that we experience is due to a complex interaction of psychological, biological, and social factors. We hope that reading this chapter has given you a better understanding of how stress affects your life and how you can reduce its impact on your physical and psychological well-being. In Enhancing Well-Being with Psychology, we'll suggest some concrete steps you can take to minimize the harmful impact of stress in *your* life.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Minimizing the Effects of Stress

Sometimes stressful situations persist despite our best efforts to resolve them. Knowing that chronic stress can jeopardize your health, what can you do to minimize the adverse impact of stress on your physical well-being? Here are four practical suggestions.

Suggestion 1: Avoid or Minimize the Use of Stimulants

In dealing with stressful situations, people often turn to stimulants to help keep them going, such as coffee or caffeinated energy drinks. If you know someone who smokes, you've probably observed that most smokers react to stress by increasing their smoking (Ng & Jeffery, 2003; Todd, 2004). The problem is that common stimulants like caffeine and nicotine actually work *against* you in coping with stress. They increase the physiological effects of stress by raising heart rate and blood pressure. In effect, users of stimulant drugs are already primed to respond with greater reactivity, exaggerating the physiological consequences of stress (Laura & others, 2010).

The best advice? Avoid stimulant drugs altogether. If that's not possible, make a conscious effort to monitor your use of stimulants, especially when you're under stress. You'll find it easier to deal with stressors when your nervous system is not already in high gear because of caffeine, nicotine, or other stimulants. Minimizing your use of stimulants will also make it easier for you to implement the next suggestion.

Suggestion 2: Exercise Regularly

Numerous studies all point to the same conclusion: Regular exercise, particularly aerobic exercise like walking, swimming, or running, is one of the best ways to reduce the impact of stress (Edenfield & Blumenthal, 2011). The key word here is *regular.* Try walking briskly for 20 minutes four or five times a week. It will improve your physical health and help you cope with stress. In fact, just about any kind of physical exercise helps buffer the negative effects of stress. (Rapidly right-clicking your computer mouse doesn't count.) Compared to sofa slugs, physically fit people are less physiologically reactive to stressors and produce lower levels of stress hormones (Hamer & others, 2006). Psychologically, regular exercise reduces anxiety and depressed feelings, and increases self-confidence and self-esteem.

Suggestion 3: Get Enough Sleep

With the ongoing push to get more and more done, people often stretch their days by short-changing themselves on sleep. But sleep deprivation just adds to your feelings of stress. "Without sufficient sleep it is more difficult to concentrate, make careful decisions, and follow instructions," explains researcher Mark Rosekind (2003). "You are more likely to make mistakes or errors, and are more prone to being impatient and lethargic. And, your attention, memory and reaction time are all adversely affected."

The stress–sleep connection also has the potential to become a vicious cycle. School, work, or family-related pressures contribute to reduced or disturbed sleep, leaving you less than adequately rested and making efforts to deal with the situation all the more taxing and distressful (Akerstedt & others, 2009). And inadequate sleep, even for just a few nights, takes a physical toll on the body, leaving us more prone to health problems (Cohen & others, 2009).

Fortunately, research indicates that the opposite is also true: Getting adequate sleep promotes resistance and helps buffer the effects of stress (Lange & others, 2010). For some suggestions to help promote a good night's sleep, see the Enhancing Well-Being with Psychology section at the end of Chapter 4.

Suggestion 4: Practice a Relaxation or Meditation Technique

You can significantly reduce stress-related symptoms by regularly using any one of a variety of relaxation techniques (Benson, 2010). *Meditation* is one effective stress reduction strategy. As discussed in Chapter 4 (see pp. 163–165), there are many different meditation techniques, but they all involve focusing mental attention, heightening awareness, and quieting internal chatter. Most meditation techniques are practiced while sitting quietly, but others involve movement, such as yoga and walking meditation. Many studies have demonstrated the physical and psychological benefits of meditation, including lessening the effects of stress (Chiesa & Serretti, 2009; Ludwig & Kabat-Zinn, 2008.

One form of meditation that has been receiving a great deal of attention in psychology is called *mindfulness meditation.* Mindfulness techniques were developed as a Buddhist practice more than two thousand years ago, but modern psychologists and other health practitioners have adapted these practices for use in a secular context (Didonna, 2008). Mindfulness practice has been shown to be helpful in both preventing and relieving stress (Jha & others, 2010; Weinstein & others, 2009).

Definitions of mindfulness are as varied as the practices associated with it. It's important to note, also, that strictly speaking, *mindfulness* refers to an approach to everyday life as well as a formal meditation technique (Shapiro & Carlson, 2009). However, for our purposes, **mindfulness meditation** can be defined as a technique in which practitioners focus *awareness* on *present experience* with *acceptance* (Siegel & others, 2008).

Advocates of mindfulness practice believe that most psychological distress is caused by a person's *reactions* to events and circumstances—their emotions, thoughts, and judgments. As psychologist Mark Williams points out, "We are always explaining the world to ourselves, and we react emotionally to these explanations rather than to the facts.... Thoughts are not facts" (Williams & others, 2007). Mindfulness practice is a way to correct that habitual perspective, clearing and calming the mind in the process. David Ludwig and Jon Kabat-Zinn (2008) explain:

> Mindfulness can be considered a universal human capacity proposed to foster clear thinking and open-heartedness. As such, this form of meditation requires no particular religious or cultural belief system. The goal of mindfulness is to maintain awareness moment by moment, disengaging oneself from strong attachment to beliefs, thoughts, or emotions, thereby developing a greater sense of emotional balance and well-being.

In other words, mindfulness meditation involves paying attention to your ongoing mental experience in a nonjudgmental, nonreactive manner (Ludwig & Kabat-Zinn, 2008; Shapiro & Carlson, 2009). *The Mindfulness of Breathing* technique is a simple mindfulness practice that is often recommended for beginners.

Mindfulness of Breathing

- Find a comfortable place to sit quietly. Assume a sitting posture that is relaxed yet upright and alert. Close your eyes and allow the muscles in your face, neck, and shoulders to slowly relax.
- Focus on your breath as your primary object of attention, feeling the breathing in and breathing out, the rise and fall of your abdomen, the sensation of air moving across your upper lip and in your nostrils, and so forth.
- Whenever some other phenomenon arises in the field of awareness, note it, and then gently bring the mind back to the breathing. As thoughts, feelings, or images arise in your mind, simply note their presence and go back to focusing your attention on the physical sensation of breathing.
- To maintain attention on your breathing, it's sometimes helpful to count your breaths. Inhale gently, exhale, and then speak the word "one" in your mind. Inhale gently, exhale, and mentally speak the word "two." Do the same up until the count of four, and then start over again. Remember, focus on the physical sensation of breathing, such as the feeling of air moving across your nostrils and upper lip, the movement of your chest and abdomen, and so forth.

How long should you meditate? Many meditation teachers advise that you begin with a short, easily attainable goal, such as meditating for five minutes without taking a break. As you become more comfortable in your practice, gradually work your way up to longer periods of time, ideally 20 to 30 minutes per session.

Sources: Shapiro & Carlson, 2009; Wallace, 2009; Williams & others, 2007.



CHAPTER REVIEW

Stress, Health, and Coping

KEY POINTS

Introduction: Stress and Health Psychology

- According to the **cognitive appraisal model, stress** is defined as a negative emotional state that occurs in response to events that are appraised as taxing or exceeding a person's resources.
- **Health psychologists** study stress and other psychological factors that influence health, illness, and treatment. Health psychologists are guided by the **biopsychosocial model.**
- **Stressors** are events or situations that produce stress. According to the life events approach, any event that requires adaptation produces stress. The Social Readjustment Rating Scale measures the impact of life events. The life events approach assumes that any change, whether good or bad, produces stress. **Daily hassles,** work stress, and **burnout** can be significant sources of stress.
- Social factors, such as crime and racism, can produce chronic stress. **Acculturative stress** can also result when people encounter different cultural values.

Physical Effects of Stress: The Mind-Body Connection

- Stress can affect health indirectly, by influencing health-related behaviors, and directly, by influencing the body's functioning.
- Walter Cannon identified the endocrine pathway involved in the **fight-or-flight response.** This pathway includes the sympathetic nervous system, the adrenal medulla, and the release of **catecholamines.**
- In studying the physical effects of prolonged stressors, Hans Selye identified the three-stage **general adaptation syndrome,** which includes the alarm, resistance, and exhaustion stages. Selye found that prolonged stress involves a second endocrine pathway, which includes the hypothalamus, the pituitary gland, the adrenal cortex, and the release of **corticosteroids.**
- Chronic stress may lead to premature aging by shortening the length of **telomeres,** the protective tips found at the end of chromosomes.
- Stress affects the functioning of the **immune system.** The most important elements of the immune system are **lymphocytes. Psychoneuroimmunology** studies the interactions among psychological processes, the nervous system, endocrine system, and immune system.
- Stressors that affect immune system functioning include both unusual and common life events, along with everyday pressures. Although stress may increase susceptibility to infection and illness, many other factors are involved in physical health.

Individual Factors That Influence the Response to Stress

- The impact of stressors is reduced when people feel a sense of control over the stressful situation. Feelings of control have both physical and psychological benefits.
- The way people explain negative events often determines whether they will persist or give up after failure. People with an **optimistic explanatory style** use external, unstable, and specific explanations for negative events. People with a **pessimistic explanatory style** use internal, stable, and global explanations for negative events. A pessimistic explanatory style contributes to stress and undermines health.
- Chronic negative emotions are related to the development of some chronic diseases. People who frequently experience negative emotions experience more stress than other people. Transient negative moods have also been shown to diminish immune system functioning.
- The **Type A behavior pattern** can predict the development of heart disease. The most critical health-compromising component of Type A behavior is hostility. Hostile people react more intensely to stressors and experience stress more frequently than do nonhostile people.
- Social isolation contributes to poor health. **Social support** improves the ability to deal with stressors by modifying the appraisal of a stressor, decreasing the physical reaction to a stressor, and making people less likely to experience negative emotions. When the quality of relationships is poor, or when social support is inappropriate or unwanted, relationships may increase stress.
- Women are more likely than men to be the providers of social support and tend to be more vulnerable to the stress contagion effect. Men are less likely to be upset by negative events that happen to people outside their immediate family.

Coping: How People Deal with Stress

- **Coping** refers to the way in which people try to change either their circumstances or their interpretations of circumstances in order to make them more favorable and less threatening. Coping may be either maladaptive or adaptive.
- When people think that something can be done to change a situation, they tend to use **problem-focused coping** strategies, which involve changing a harmful stressor.
- When people think that a situation cannot be changed, they tend to rely on **emotion-focused coping** strategies, which involve changing their emotional reactions to the stressor.
- Problem-focused coping strategies include confrontive coping and planful problem solving.
- Emotion-focused coping strategies include escape–avoidance, seeking social support, distancing, denial, positive reappraisal and religious coping. Effective coping is flexible, and people often rely on multiple coping strategies in stressful situations.
- Culture affects the choice of coping strategies. People in individualistic cultures tend to favor problem-focused strategies. People in collectivistic cultures are more likely to seek social support, and they emphasize emotion-focused coping strategies more.

KEY TERMS

stress, p. 527
cognitive appraisal model, p. 527
health psychology, p. 528
biopsychosocial model, p. 529
stressors, p. 529
daily hassles, p. 531
burnout, p. 532
acculturative stress, p. 534
fight-or-flight response, p. 535
catecholamines, p. 535
corticosteroids, p. 536
general adaptation syndrome, p. 537
telomeres, p. 537
immune system, p. 539
lymphocytes, p. 539
psychoneuroimmunology, p. 539
optimistic explanatory style, p. 543
pessimistic explanatory style, p. 543
Type A behavior pattern, p. 544
social support, p. 547
coping, p. 550
problem-focused coping, p. 550
emotion-focused coping, p. 551
mindfulness meditation, p. 555

KEY PEOPLE

Walter B. Cannon (1871–1945) American physiologist who made several important contributions to psychology, especially in the study of emotions. Described the fight-or-flight response, which involves the sympathetic nervous system and the endocrine system (also see Chapter 8). (p. 535)

Richard Lazarus (1922–2002) American psychologist who helped promote the cognitive perspective on emotion and stress; developed the cognitive appraisal model of stress and coping with co-researcher Susan Folkman (also see Chapter 8). (p. 527)

Martin Seligman (b. 1942) American psychologist who conducted research on explanatory style and the role it plays in stress, health, and illness. (p. 543)

Hans Selye (1907–1982) Canadian endocrinologist who was a pioneer in stress research; defined stress as "the nonspecific response of the body to any demand placed on it" and described a three-stage response to prolonged stress that he termed the general adaptation syndrome. (p. 536)

CONCEPT REVIEW ANSWERS

13.1 page 541

1. False. The biopsychosocial model holds that health and illness are determined by the interaction of biological, psychological, and social factors.
2. False. Exposure to life events is only one of many factors that influence health and illness.
3. False. The Social Readjustment Rating Scale measures stress due to life events.
4. False. During periods of prolonged stress, the adrenal cortex secretes corticosteroids.
5. False. Shelley is probably experiencing the alarm stage of the general adaptation syndrome.
6. True.

13.2 page 546

1.f 2.e 3.a 4.c 5.b

13.3 page 554

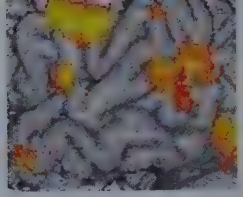
1.d 2.g 3.e 4.c 5.a 6.b 7.f



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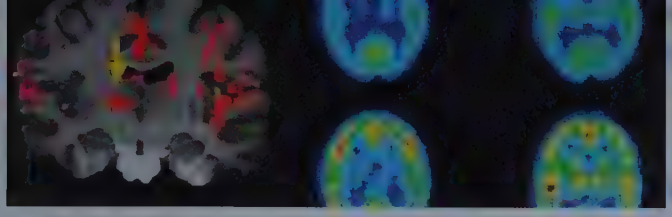




CHAPTER 14

Psychological Disorders







Behind the Steel Door

PROLOGUE

ALTHOUGH IT HAPPENED more than 40 years ago, the memories are still vivid. I was just 13, and my dad was in the hospital with a serious kidney problem. Because my school was only three blocks from St. Luke's Hospital, I visited him every day before going to my paper route.

Lost in my thoughts as I walked through the maze of dim hospital hallways, I took a wrong turn. When I got near the end of the hallway, I realized it was a dead end and started to turn around. That's when her voice pierced the silence, screaming in agony. "*Help me!* Fire! Fire! *Please* help me!"

I saw a panic-stricken face against the small wire-reinforced window of a steel door. I ran to the door and tried to open it, but it was locked.

"Help me, *somebody!* Fire!" she screamed again.

"I'll get help!" I said loudly through the door, but she didn't seem to see or hear me. My heart racing, I ran back to a nurses' station.

"There's a woman who needs help! There's a fire!" I excitedly explained to a nurse.

But instead of summoning help, the nurse looked at me with what can only be described as disdain. "Which hallway?" she said flatly, and I pointed in the direction from which I had come. "That's the psychiatric ward down there," she explained. "Those people are crazy."

I stared at her for a moment, feeling confused. *Crazy?* "But she needs help," I finally blurted out.

"That's why she's on the psychiatric ward," the nurse replied calmly. "Which room are you trying to find?"

I didn't answer her. Instead, I walked back down the hallway. I took a deep breath and tried to slow my heart down as I approached the steel door. The woman was still there, talking loudly and pacing. I watched her through the wire-reinforced glass for several seconds. She was completely oblivious to my presence. Then she shouted, "There's fire! I see fire! *Fire!*"

She looked like she was in her early 20s. Her face looked gaunt. I remember the dark circles under her deep-set eyes, her pupils dilated with sheer, raw panic.

"Listen to me," I tried to say calmly, tapping on the glass. "My name is Don. There's *no* fire."

"Help me, *please,*" she sobbed, moving closer to the door.

That's when two attendants came, one male, one female. They spoke to her for several seconds, then stood quietly, waiting for her to respond. When they tried to coax her away from the door, she pushed at their hands. Gently but firmly, they guided the young woman away. For just an instant, the young woman turned and seemed to look directly into my eyes.

IN THIS CHAPTER:

- Introduction: Understanding Psychological Disorders
- Anxiety Disorders: Intense Apprehension and Worry
- Mood Disorders: Emotions Gone Awry
- Eating Disorders: Anorexia and Bulimia
- Personality Disorders: Maladaptive Traits
- The Dissociative Disorders: Fragmentation of the Self
- Schizophrenia: A Different Reality
- ENHANCING WELL-BEING WITH PSYCHOLOGY: Understanding and Helping to Prevent Suicide

"It's okay, there's *no* fire!" I blurted out as they led her down the hallway.

Silence. I stood by the steel door, my mind racing. I had never seen someone that confused before. Never. *What was wrong with her? Where did they take her? Did she really see fire? What was going to happen to her?*

When I finally got to my dad's hospital room, we talked the entire time about the young woman. My dad reassured me that the hospital staff would take care of the woman, especially in her extreme state of confusion. But he wasn't able to answer my questions, so he arranged for me to talk to a friend of his, a psychiatrist named Dr. Starr.

Dr. Starr was perplexed by the locked door. "It's not normally a locked ward," he said. Eventually, he determined that I had been standing at the service entrance at the back of the ward, where the kitchen and housekeeping staff bring in the food and linen carts. "If you go to the actual entrance of the ward," he said, "it's not locked. You can look in and see it's actually quite nice."

He carefully listened as I described the young woman I had seen, nodding several times as I spoke. "She must have just been admitted to the hospital," he said. "There are medications that can help her, but she probably hadn't gotten them yet. Don't worry, I'm sure they'll take good care of her." Years later, I realized that the young woman was probably suffering from *schizophrenia*, a serious mental disorder that is often accompanied by vivid hallucinations that can seem frighteningly real.

In the course of our conversation, Dr. Starr also explained his own training and background. After attending medical school, he had specialized in psychiatry. Because he had had medical training, he was qualified to prescribe medication. Some of his colleagues were clinical psychologists. Although they couldn't write prescriptions, they were trained to use psychotherapy to help people with psychological disorders.

It was right then and there that I decided I wanted to be a clinical psychologist and help people like the confused woman I had seen. Six years later as a college sophomore majoring in psychology, I started working as a technician on the psychiatric unit of a large hospital. For almost seven years I worked at psychiatric facilities, learning enormously from both psychiatrists and clinical psychologists about caring for people with severe mental disorders.

In this chapter, you'll learn about the symptoms that characterize some of the most common psychological disorders, including the disorder experienced by the young woman who saw fire. The symptoms of many psychological disorders are not as outwardly severe as those the young woman was experiencing on that particular day. But whether the psychological symptoms are obvious or not, they can seriously impair a person's ability to function. You'll also learn in this chapter about some of the underlying causes of psychological disorders. As you'll see, biological, psychological, and environmental factors have been implicated as contributing to many psychological disorders.



Introduction: Understanding Psychological Disorders

KEY THEME

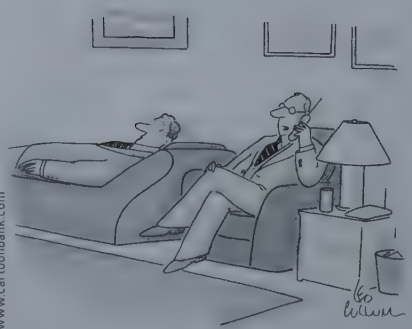
› Understanding psychological disorders includes considerations of their origins, symptoms, and development, as well as how behavior relates to cultural and social norms.

KEY QUESTIONS

› What is a psychological disorder, and what differentiates abnormal behavior from normal behavior?

› What is DSM-IV-TR, and how was it developed?

› How prevalent are psychological disorders?



Leo Cullum/The New Yorker Collection/ www.cartoonbank.com

"I'm going to be late, dear. It's total craziness here."

Does the cartoon on the left make you smile? The cartoon is humorous, but it's actually intended to make some serious points. It reflects several common misconceptions about psychological disorders that we hope to dispel by this chapter.

First, there's the belief that "crazy" behavior is very different from "normal" behavior. Granted, sometimes it is, like the behavior of the young woman who was screaming "Fire!" when there was no fire. But as you'll see throughout this chapter, the line that divides "normal" and "crazy" behavior is often not as sharply defined as most people think. In many instances, the difference between normal and abnormal behavior is a matter of degree. For example, as you leave your apartment or house, it's normal to check or even double-check that the door is securely locked. However, if you feel compelled to go back and check the lock 50 times, it would be considered abnormal behavior.

The dividing line between normal and abnormal behavior is also often determined by the social or cultural context in which a particular behavior occurs. For example, among traditional Hindus in India, certain dietary restrictions are followed as part of the mourning process. It would be a serious breach of social norms if an Indian widow ate fish, meat, onions, garlic, or any other "hot" foods within six months of her husband's death. A Catholic widow in the United States would consider such restrictions absurd.

Second, when we encounter people whose behavior strikes us as weird, unpredictable, or baffling, it's easy to simply dismiss them as "crazy" as in the cartoon or in the nurse's insensitive response in the Prologue. Although convenient, such a response is too simplistic, not to mention unkind. It could also be wrong. Sometimes, unconventional people are labeled as crazy when they're actually just creatively challenging the conventional wisdom with new ideas.

Even if a person's behavior is seriously disturbed, labeling that person as "crazy" tells us nothing meaningful. What are the person's specific symptoms? What might be the cause of the symptoms? How did they develop? How long can they be expected to last? And how might the person be helped? The area of psychology and medicine that focuses on these questions is called **psychopathology**—the scientific study of the origins, symptoms, and development of psychological disorders. In this chapter and the next, we'll take a closer look at psychological disorders and their treatment.

Finally, there is still a strong social stigma attached to suffering from a psychological disorder (Thornicroft, 2006; Ben-Zeev & others, 2010). Because of the social stigma that can be associated with psychological disorders, people are often reluctant to seek the help of mental health professionals (Arboleda-Florez & Sartorius, 2008; Bathje & Pryor, 2011). People who *are* under the care of a mental health professional often hide the fact, telling only their closest friends—and understandably so. Being labeled "crazy" carries all kinds of implications, most of which reflect negative stereotypes about people with mental illness (Wirth & Bodenhausen, 2009). In the Critical Thinking box "Are People with a Mental Illness as Violent as the Media Portray Them?" on the next page, we discuss the accuracy of such stereotypes in more detail.

psychopathology The scientific study of the origins, symptoms, and development of psychological disorders.

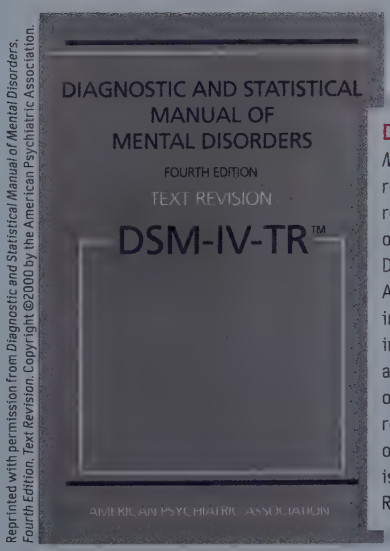
psychological disorder or **mental disorder** A pattern of behavioral and psychological symptoms that causes significant personal distress, impairs the ability to function in one or more important areas of life, or both.

DSM-IV-TR Abbreviation for the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision; the book published by the American Psychiatric Association that describes the specific symptoms and diagnostic guidelines for different psychological disorders.

What Is a Psychological Disorder?

What exactly are we talking about when we say that someone has a psychological or mental disorder? A **psychological disorder** or **mental disorder** can be defined as a pattern of behavioral or psychological symptoms that causes significant personal distress, impairs the ability to function in one or more important areas of life, or both (DSM-IV-TR, 2000). An important qualification is that the pattern of behavioral or psychological symptoms must represent a serious departure from the prevailing social and cultural norms. Hence, the behavior of a traditional Hindu woman who refuses to eat onions, garlic, or other "hot" foods following the death of her husband is perfectly normal because that norm is part of the Hindu culture.

What determines whether a given pattern of symptoms or behaviors qualifies as a psychological disorder? Throughout this chapter, you'll notice numerous references to DSM-IV-TR. **DSM-IV-TR** stands for *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision,* which was published by the American Psychiatric Association in 2000. (DSM-IV was published in 1994. The updated "text revision" of DSM-IV was published in 2000 to incorporate new research and information.)



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DSM-IV-TR *The Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, was revised in 2000 with updated research. Currently, researchers are engaged in the lengthy process of assembling the fifth edition, to be called DSM-5, replacing the Roman numeral with an Arabic number. DSM-5 is a collaborative effort involving several mental health organizations, including the American Psychiatric Association and the World Health Organization. One key goal of DSM-5 is to incorporate the multidisciplinary research advances in mental health that have occurred worldwide in recent years. DSM-5 is scheduled to be published in 2013 (Kupfer & Regier, 2010).

CRITICAL THINKING

Are People with a Mental Illness as Violent as the Media Portray Them?

A children's show on public television presented a retelling of the classic novel *Tom Sawyer* by Mark Twain. However, the name of the chief villain had been changed: Twain's "Injun Joe" had been renamed "Crazy Joe." As this example illustrates, writers for television are well aware that it is no longer considered acceptable to portray negative stereotypes of particular racial or ethnic groups, including Native Americans. Unfortunately, it also illustrates that another stigmatized group is still fair game: the mentally ill.

Multiple studies have found that people with a major mental illness belong to one of the most stigmatized groups in modern society (Corrigan & O'Shaughnessy, 2007). In much of the popular media, people with psychological disorders are portrayed in highly negative, stereotyped ways (Klin & Lemish, 2008). One stereotype is that of the mentally disturbed person as a helpless victim. The other stereotype is that of the mentally disordered person as an evil villain who is unpredictable, dangerous, and violent.

One comprehensive survey found that although 5 percent of "normal" television characters are murderers, 20 percent of "mentally ill" characters are killers (Gerbner, 1998). The same survey found that about 40 percent of normal characters were violent, but 70 percent of characters labeled as mentally ill were violent. This media stereotype reflects and reinforces the widespread belief among Americans that people with mental illness are violent and threatening (Diefenbach & West, 2007). Further reinforcing that belief is selective media reporting that sensationalizes violent acts by people with mental disorders. Clearly, the public perception that people with a mental illness are dangerous contributes to the stigma of mental illness (Fazel & others, 2009).

Are people with mental disorders more violent than other people? One groundbreaking study by psychologist Henry Steadman and his colleagues (1998) monitored the behavior of more than 1,000 former mental patients in the year after they were discharged from psychiatric facilities. For their control group, they also monitored a matched group of people who were not former mental patients but were living in the same neighborhood.

The researchers found that, overall, the former mental patients did *not* have a higher rate of violence than the comparison group. Former mental patients who demonstrated symptoms of substance abuse were the most likely to engage in violent behavior. However, the same was also true of the control group. In other words, substance abuse was associated with more violent behavior in *all* the participants, whether they had a history of mental illness or not. The study also found that the violent behavior that *did* occur was most frequently aimed at friends and family members, not at strangers.

Recent meta-analytic research reviews have confirmed the general finding that substance abuse greatly increases the risk of violent behavior by people who have been diagnosed with a severe mental illness, such as schizophrenia (see Douglas & others, 2009; Fazel & others, 2009). Beyond substance abuse, there is evidence that people with severe mental disorders who are experiencing extreme psychological symptoms, such as bizarre delusional ideas and hallucinated voices, do display a *slightly* higher level of violent and illegal behavior than do "normal" people (Malla & Payne, 2005). However, the person with a mental disorder who is *not* suffering from such symptoms is no more likely than the average person to be involved in violent or illegal behavior. Other factors, such as living in impoverished neighborhoods and abusing drugs or alcohol, are stronger predictors of violence (Norko & Baranoski, 2005).



Warner Bros./Courtesy Everett Collection

Hollywood Versus Reality In *The Dark Knight*, the Joker takes the image of the insane killer to new heights. As a plot device, the deranged, evil killer on the loose is standard fare in television dramas like *CSI* and film thrillers like the *Halloween* and *Friday the 13th* movies. Such media depictions foster the stereotype that people with a mental illness are evil, threatening, and prone to violence—an image that is *not* supported by psychological research.

Canadian psychologist Kevin Douglas and his colleagues (2009) emphasize that the overall size of the association between psychosis and violence is relatively small. As they point out, "Most violent individuals are not psychotic, and most psychotic individuals are not violent."

Clearly, the incidence of violent behavior among current or former mental patients is exaggerated in media portrayals. In turn, the exaggerated fear of violence from people with a psychological disorder contributes to the stigma of mental illness (Fazel & others, 2009). As one comprehensive review of the research emphasized, "The overall contribution of mental disorders to the total level of violence in society is exceptionally small. In fact, there is very little risk of violence or harm to a stranger from casual contact with an individual who has a mental disorder" (U.S. Department of Health & Human Services, 1999).

CRITICAL THINKING QUESTIONS

- Can you think of any reasons why people with psychological disorders are more likely to be depicted as villains than members of other social groups?
- Can you think of any television shows or movies in which characters with a severe psychological disorder were shown in a sympathetic light? If so, are such depictions more or less common than depictions of people with a mental illness as dangerous or violent?
- What evidence could you cite to challenge the notion that people with psychological disorders are dangerous?

DSM-IV-TR is a book that describes more than 300 specific psychological disorders. It includes the symptoms, the exact criteria that must be met to make a diagnosis, and the typical course for each mental disorder. An example of the diagnostic criteria for one mental disorder is shown in Figure 14.1. DSM-IV-TR provides mental health professionals with both a common language for labeling mental disorders and comprehensive guidelines for diagnosing them.

The first edition of *Diagnostic and Statistical Manual* was published in 1952. With each new edition, the number of distinct disorders has progressively increased—from fewer than a hundred in the first edition to more than three times that number in the current version (Horwitz, 2002; Houts, 2002). Some disorders that are relatively well-known today, such as eating disorders, attention-deficit hyperactivity disorder, and social phobia, were not added until later editions. And some behavior patterns that were categorized as "disorders" in early editions, such as homosexuality, have been dropped from later editions because they are no longer considered to be psychological disorders.

It's important to understand that DSM-IV-TR was not written by a single person or even a small group of experts. Rather, DSM-IV-TR represents the *consensus* of a wide range of mental health professionals representing many different organizations and perspectives. In developing DSM-IV-TR, teams of mental health professionals conducted extensive reviews of the research findings for each category of mental disorder. More than 1,000 mental health experts, mostly psychiatrists and clinical psychologists, participated in the development of DSM-IV-TR. More than 60 professional organizations, including the American Psychological Association and the Association of Psychological Science, reviewed early drafts of DSM-IV-TR. Despite these efforts, DSM-IV-TR has many critics (e.g., Achenback, 2009; Maser & others, 2009). More specifically, it has been criticized for:

- including some conditions that are too "normal" to be considered disorders, such as excessive shyness (Lane, 2007; Langenbucher & Nathan, 2006)
- using arbitrary cutoffs to draw the line between people with and without a particular disorder (J. Cohen & others, 2011; Livesley, 2011)
- gender bias (Caplan & Cosgrove, 2004; Wittchen, 2010)
- insufficient sensitivity to cultural diversity (Eriksen & Kress, 2005; Caetano, 2011)

Diagnostic Criteria for 301.7 Antisocial Personality Disorder

A. There is a pervasive pattern of disregard for and violation of the rights of others occurring since age 15 years, as indicated by three (or more) of the following:

   (1) failure to conform to social norms with respect to lawful behaviors as indicated by repeatedly performing acts that are grounds for arrest
   (2) deceitfulness, as indicated by repeated lying, use of aliases, or conning others for personal profit or pleasure
   (3) impulsivity or failure to plan ahead
   (4) irritability and aggressiveness, as indicated by repeated physical fights or assaults
   (5) reckless disregard for safety of self or others
   (6) consistent irresponsibility, as indicated by repeated failure to sustain consistent work behavior or honor financial obligations
   (7) lack of remorse, as indicated by being indifferent to or rationalizing having hurt, mistreated, or stolen from another

B. The individual is at least age 18 years.
C. There is evidence of Conduct Disorder with onset before age 15 years.
D. The occurrence of antisocial behavior is not exclusively during the course of Schizophrenia or a Manic Episode.

FIGURE 14.1 Sample DSM-IV-TR Diagnostic Criteria Each of the more than 300 psychological disorders described in DSM-IV-TR has specific criteria that must be met for a person to be diagnosed with that disorder. Shown at left are the DSM-IV-TR criteria for antisocial personality disorder, which is also referred to as *psychopathy* or *sociopathy*. The number 301.7 identifies the specific disorder according to an international code developed by the World Health Organization. The code helps researchers make statistical comparisons of the prevalence of mental disorders in different countries and cultures.

Source: DSM-IV-TR (2000), p. 706.

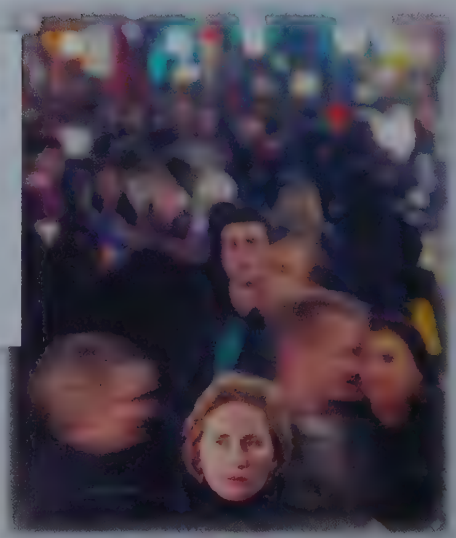
For more than a decade, clinicians and researchers have been working on the next version of Diagnostic and Statistical Manual, to be titled *DSM-5,* and which is scheduled to be published in 2013 (Kupfer & Regier, 2010). Even in advance of publication, some of the proposed changes have attracted controversy. One concern is that some of the proposed diagnostic categories may blur the distinction between everyday, normal unhappiness and "mental illness." If the threshold for diagnosing mental disorders is set too low, some critics argue, too many people will be diagnosed with a "mental disorder" (Angell, 2011). Or, as psychiatrist Allen Frances (2010) puts it, "The difficulties people have in meeting society's expectations should not all be labeled as mental disorders."

Until DSM-5 is available, DSM-IV-TR remains the most comprehensive and authoritative set of guidelines available for diagnosing psychological disorders. Thus, we'll refer to it often in this chapter.

The Prevalence of Psychological Disorders

A 50–50 Chance?

Just how common are psychological disorders? To investigate that question, researcher Ronald C. Kessler and his colleagues (2005a, 2005b) conducted a nationally representative survey of more than 9,000 Americans, ages 18 and older. Called the National Comorbidity Survey Replication (NCS-R), the survey involved more than two years of face-to-face interviews throughout the country. Participants were asked if they had experienced specific symptoms of psychological disorders (a) during the previous 12 months and (b) at any point in their lives. They were also asked about possible risk factors associated with mental disorders, such as substance use.



REUTERS/Luke MacGregor

How Prevalent Are Psychological Disorders? Psychological disorders are far more common than most people think. According to the National Comorbidity Survey Replication (NCS-R), about one in four American adults has experienced the symptoms of some type of psychological disorder during the previous year. However, most people who experience such symptoms do not receive treatment (Wang & others, 2005).

The NCS-R results reconfirmed many of the findings of previous national surveys, including the finding that psychological disorders are much more prevalent than many people believe (Kessler & others, 2005c). Specifically, the NCS-R found that one out of four respondents (26 percent) reported experiencing the symptoms of a psychological disorder during the previous year (Kessler & others, 2005b). The NCS-R and other surveys like it also reveal a high degree of *comorbidity,* which means that people diagnosed with one disorder are also frequently diagnosed with another disorder as well.

Figure 14.2 shows the typical age of onset for some of the common mental disorders reported by the NCS-R respondents at any point in their life. As you can see in the left chart, the different categories of mental disorders vary significantly in the median age of onset. Anxiety disorders and impulse control disorders tend to begin at a much earlier age—around age 11—as compared to substance abuse disorders or mood disorders. In the right-hand chart, you can see the lifetime prevalence of the same categories of mental disorders. Like the original National Comorbidity Survey, the NCS-R found that almost one out of two adults (46%) had experienced the symptoms of a psychological disorder at some point thus far in their lives.

Although it might initially seem disturbing to think that half of the adult population will experience the symptoms of a mental disorder, lead researcher Ronald C. Kessler helps put these findings into perspective. As Kessler (2003b) points out,

> It wouldn't surprise anyone if I said that 99.9% of the population had been physically ill at some time in their life. Why, then, should it surprise anyone that 50% of the population has been mentally ill at some time in their life? The reason, of course, is that we

The mentally ill are not some distinct set of "them" out there who are completely different from "us" sane people. Instead, the vast majority of us have been touched by some form of mental illness at some time in our lives either through personal experience or through the illness of a close loved one.

–Ronald C. Kessler (2003a)

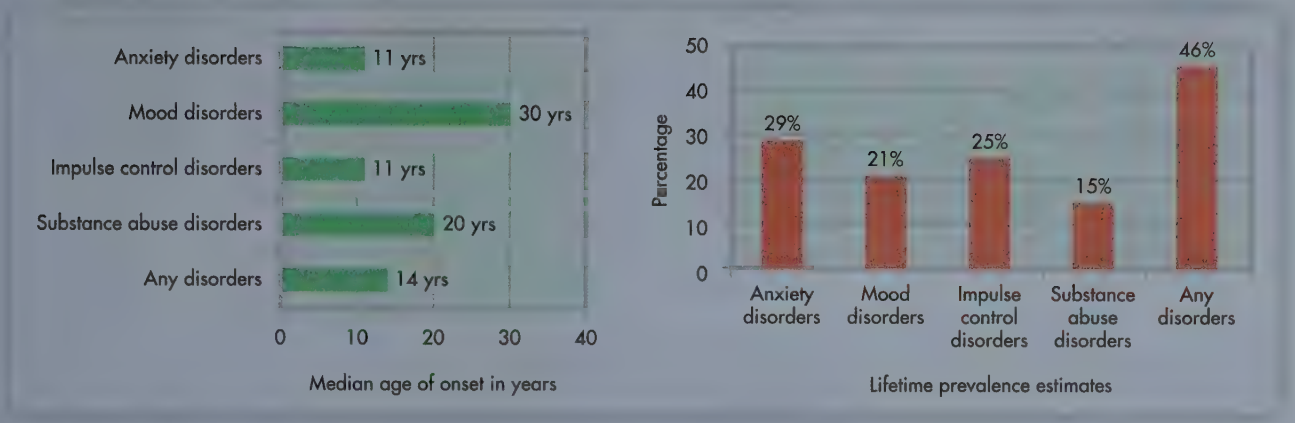


FIGURE 14.2 Age of Onset and the Lifetime Prevalence of Mental Disorders The chart on the left shows the median age of onset for common categories of mental disorders in the National Comorbidity Survey Replication (NCS-R). While the onset of anxiety disorders or impulse control disorders tends to occur in the preteen years, the onset of mood disorders typically occurs around age 30, well into young adulthood. The chart on the right shows the lifetime prevalence for the same mental disorder categories. The NCS-R reconfirmed that the lifetime prevalence of experiencing a mental disorder is almost one out of two.

invest the term 'mentally ill' with excess meaning. A number of common mental illnesses, like adjustment disorders and brief episodes of depression, are usually mild and self-limiting. Many people experience these kinds of disorders at some time in their lives.

The NCS-R found that most people with the symptoms of a mental disorder (59 percent) received no treatment during the past year. Of those who did receive some kind of treatment, it was usually provided by a general medical practitioner, psychiatrist, or mental health specialist. Even so, the treatment provided was often inadequate, falling short of established treatment guidelines (Wang & others, 2005).

It seems clear that many people who could benefit from mental health treatment don't receive it. Many factors contribute to this unmet need, including lack of insurance, low income, and living in rural areas where mental health care facilities might not be available. Some people lack awareness about psychological disorders or shun treatment for fear of being stigmatized for seeking help with troubling psychological symptoms.

On the other hand, it also seems clear that most people manage to weather psychological symptoms without becoming completely debilitated and needing professional intervention (Mojtabai & others, 2011). One explanation for this is that people use a variety of coping strategies—some more effective than others—to manage psychological symptoms.

But it's important to remember that even ineffective strategies can appear to be effective. Why? Because the symptoms of many psychological disorders, especially those involving mild to moderately disruptive symptoms, diminish with the simple passage of time or with improvements in the person's overall situation. Nevertheless, there are many effective treatments available for psychological disorders that can produce improvements that occur much more quickly and endure longer. We'll look at the different types of therapies used to treat psychological disorders in the next chapter.

For the remainder of this chapter, we'll focus on psychological disorders in six DSM-IV-TR categories: anxiety disorders, mood disorders, eating disorders, personality disorders, dissociative disorders, and schizophrenia. Along with being some of the most common disorders encountered by mental health professionals, they're also the ones that our students ask about most often. To help you distinguish between normal and maladaptive behaviors, we'll start the discussion of each mental disorder category by describing behavior that falls within the normal range of psychological functioning, such as normal feelings of anxiety or normal variations in mood.

Table 14.1 on the next page describes other categories of mental disorders contained in DSM-IV-TR. Some of these disorders have been discussed in previous chapters. In the Enhancing Well-Being with Psychology section at the end of this chapter, we'll look at what you can do to help prevent one of the most disturbing consequences of psychological problems—suicide.

TABLE 14.1

Some Key Diagnostic Categories in DSM-IV-TR

Diagnostic Category	Core Features	Examples of Specific Disorders
Infancy, childhood, or adolescent disorders	Includes a wide range of developmental, behavioral, learning, and communication disorders that are usually first diagnosed in infancy, childhood, or adolescence. Symptoms of a particular disorder may vary depending on a child's age and development level.	**Autistic disorder:** Onset of symptoms prior to age of 3. Characterized by severely impaired social and communication skills, including delayed or a complete lack of language development. Symptoms often include repetitive behaviors, such as body rocking, and abnormal interests, such as intense preoccupation with mechanical toys. **Tourette's disorder:** Onset prior to age of 18. Characterized by motor tics, such as recurring spasmodic movements of the head or arms, and vocal tics, such as recurring and sudden clicking, grunting, or snorting sounds. Sometimes involves uncontrollable utterances of profane or obscene words.
Substance-related disorders (see Chapter 4)	Occurrence of adverse social, behavioral, psychological, and physical effects from seeking or using substances such as alcohol, amphetamines, cocaine, marijuana, hallucinogens, and other drugs.	**Substance abuse:** A recurring pattern of impaired ability to function at work, school, or home due to repeated substance use. **Substance dependence:** A maladaptive pattern of substance use usually resulting in drug tolerance, withdrawal symptoms when the drug is discontinued, and compulsive drug-taking behavior that seriously impairs occupational and social functioning.
Somatoform disorders	Persistent, recurring complaints of bodily (or somatic) symptoms that have no physical or medical basis.	**Body dysmorphic disorder:** Exaggerated concern and preoccupation about minor or imagined defects in appearance. **Hypochondriasis:** Preoccupation with imagined diseases based on the person's misinterpretation of bodily symptoms or functions.
Sexual and gender identity disorders (see Chapter 10)	Difficulty in the expression of normal sexuality, including confusion about gender identity, decreased sexual desire or arousal, difficulty having or in timing of orgasm, pain or discomfort during sex, or the use of inappropriate objects to produce sexual arousal.	**Fetishism:** Recurrent, intense, sexually arousing fantasies, urges, or behaviors, usually involving nonliving objects, such as female undergarments, shoes, boots, or other articles of clothing. **Gender identity disorder:** The strong and persistent desire to be the other sex.
Sleep disorders (see Chapter 4)	Disruptions in the amount, quality, or timing of sleep. Includes difficulty initiating or maintaining sleep, excessive sleepiness, or abnormal behavioral or psychological events during sleep or sleep–wake transitions.	**Narcolepsy:** Recurrent episodes of unintended sleep in inappropriate situations, such as while driving a car or attending a meeting. **Sleep terror disorder:** Repeated episodes of abruptly awakening from sleep, usually beginning with a panicky scream or cry. Intense fear, rapid heartbeat and breathing, sweating, and other signs of autonomic arousal are evident. Also called *night terror* disorder.
Impulse-control disorders	Inability to resist an impulse, urge, or temptation to perform an act that is harmful to the self or others.	**Kleptomania:** The impulse to steal objects not needed for personal use or monetary value. **Pyromania:** The urge to set fires for pleasure, gratification, or relief of tension.

Source: DSM-IV-TR (2000).



Anxiety Disorders

Intense Apprehension and Worry

KEY THEME

› The main symptom of anxiety disorders is intense anxiety that disrupts normal functioning.

KEY QUESTIONS

› How does pathological anxiety differ from normal anxiety?

› What characterizes generalized anxiety disorder and panic disorder?

› What are the phobias, and how have they been explained?

Anxiety is a familiar emotion to all of us—that feeling of tension, apprehension, and worry that often hits during personal crises and everyday conflicts. Although it is unpleasant, anxiety is sometimes helpful. Think of anxiety as your personal, internal

alarm system that tells you that something is not quite right. When it alerts you to a realistic threat, anxiety is adaptive and normal. For example, anxiety about your grades may motivate you to study harder.

Anxiety has both physical and mental effects. As your internal alarm system, anxiety puts you on *physical alert,* preparing you to defensively "fight" or "flee" potential dangers. Anxiety also puts you on *mental alert,* making you focus your attention squarely on the threatening situation. You become extremely vigilant, scanning the environment for potential threats. When the threat has passed, your alarm system shuts off and you calm down. But even if the problem persists, you can normally put your anxious thoughts aside temporarily and attend to other matters.

In the **anxiety disorders,** however, the anxiety is *maladaptive,* disrupting everyday activities, moods, and thought processes. It's as if you've triggered a faulty car alarm that activates at the slightest touch and has a broken "off" switch.

Three features distinguish normal anxiety from pathological anxiety. First, pathological anxiety is *irrational.* The anxiety is provoked by perceived threats that are exaggerated or nonexistent, and the anxiety response is out of proportion to the actual importance of the situation. Second, pathological anxiety is *uncontrollable.* The person can't shut off the alarm reaction, even when he or she knows it's unrealistic.

And third, pathological anxiety is *disruptive.* It interferes with relationships, job or academic performance, or everyday activities. In short, pathological anxiety is unreasonably intense, frequent, persistent, and disruptive (Beidel & Stipelman, 2007; Woo & Keatinge, 2008).

Anxiety disorders are among the most common of all psychological disorders. According to some estimates, they will affect about one in four people in the United States during their lifetimes (McGregor, 2009; Kessler & others, 2005b). Evidence of disabling anxiety disorders has been found in virtually every culture studied, although symptoms may vary from one cultural group to another (Chentsova-Dutton & Tsai, 2007; Good & Hinton, 2009). Most of the anxiety disorders are much more common in women than men (Barlow & others, 2007).

As a symptom, anxiety occurs in many different psychological disorders. In the anxiety disorders, however, anxiety is the *main* symptom, although it is manifested differently in each of the disorders.



Generalized Anxiety Disorder

Worrying About Anything and Everything

Global, persistent, chronic, and excessive apprehension is the main feature of **generalized anxiety disorder (GAD).** People with this disorder are constantly tense and anxious, and their anxiety is pervasive. They feel anxious about a wide range of life circumstances, sometimes with little or no apparent justification (Craske & Waters, 2005; Sanfelippo, 2006). The more issues about which a person worries excessively, the more likely it is that he or she suffers from generalized anxiety disorder (DSM-IV-TR, 2000).

Normally, anxiety quickly dissipates when a threatening situation is resolved. In generalized anxiety disorder, however, when one source of worry is removed, another quickly moves in to take its place. The anxiety can be attached to virtually any object or to none at all. Because of this, generalized anxiety disorder is sometimes referred to as *free-floating anxiety.*

Explaining Generalized Anxiety Disorder

What causes generalized anxiety disorder? As is true with most psychological disorders, environmental, psychological, and genetic as well as other biological factors are probably involved in GAD (Allen & others, 2008; Stein & Steckler, 2010). For example, a brain that is "wired" for anxiety can give a person a head start toward

anxiety An unpleasant emotional state characterized by physical arousal and feelings of tension, apprehension, and worry.

anxiety disorders A category of psychological disorders in which extreme anxiety is the main diagnostic feature and causes significant disruptions in the person's cognitive, behavioral, or interpersonal functioning.

generalized anxiety disorder (GAD) An anxiety disorder characterized by excessive, global, and persistent symptoms of anxiety; also called *free-floating anxiety.*

panic attack A sudden episode of extreme anxiety that rapidly escalates in intensity.

panic disorder An anxiety disorder in which the person experiences frequent and unexpected panic attacks.

agoraphobia An anxiety disorder involving the extreme and irrational fear of experiencing a panic attack in a public situation and being unable to escape or get help.

developing GAD in later life, but problematic relationships and stressful experiences can make the possibility more likely. Signs of problematic anxiety can be evident from a very early age, such as in the example of a child with a very shy temperament who consistently feels overwhelming anxiety in new situations or when separated from his parents. In some cases, such children develop anxiety disorders such as GAD in adulthood (Weems & Silverman, 2008; Creswell & O'Connor, 2011).

Panic Attacks and Panic Disorders

Sudden Episodes of Extreme Anxiety

Generalized anxiety disorder is like the dull ache of a sore tooth—a constant, ongoing sense of uneasiness, distress, and apprehension. In contrast, a **panic attack** is a sudden episode of extreme anxiety that rapidly escalates in intensity. The most common symptoms of a panic attack are a pounding heart, rapid breathing, breathlessness, and a choking sensation. The person may also sweat, tremble, and experience light-headedness, chills, or hot flashes. Accompanying the intense, escalating surge of physical arousal are feelings of terror and the belief that one is about to die, go crazy, or completely lose control. A panic attack typically peaks within 10 minutes of onset and then gradually subsides. Nevertheless, the physical symptoms of a panic attack are so severe and frightening that it's not unusual for people to rush to an emergency room, convinced they are having a heart attack, stroke, or seizure (Beidel & Stipelman, 2007; Craske & Barlow, 2008).

Sometimes panic attacks occur after a stressful experience, such as an injury or illness, or during a stressful period of life, such as while changing jobs or during a period of marital conflict (Moitra & others, 2011). Experiences of bereavement, separation from significant others, and interpersonal loss are among the experiences most often associated with triggering panic attacks (Klauke & others, 2010). In other cases, however, panic attacks seem to come from nowhere.

When panic attacks occur *frequently* and *unexpectedly,* the person is said to be suffering from **panic disorder.** In this disorder, the frequency of panic attacks is highly variable and quite unpredictable. One person may have panic attacks several times a month. Another person may go for months without an attack and then experience panic attacks for several days in a row. Understandably, people with panic disorder are quite apprehensive about when and where the next panic attack will hit (Craske & Waters, 2005; Good & Hinton, 2009).

As a result, some panic disorder sufferers go on to develop **agoraphobia,** a fear of having a panic attack in a place from which escape would be difficult or impossible (Craske & Barlow, 2008). Crowds, stores or elevators, public transportation, standing in lines, and traveling in a car may all be avoided because of the fear of suffering a panic attack and being unable to escape the situation. Consequently, many people with agoraphobia live like prisoners in their own homes.

For example, Hahnee, a 45-year-old mother of two, experienced infrequent but intense attacks of anxiety and fearfulness. Heart pounding and perspiring heavily, she felt as though she couldn't breathe. One time her children called an ambulance because Hahnee was convinced she was having a heart attack. As her panic attacks increased in frequency and severity, Hahnee quit her job, fearful that she might have a panic attack at work. Eventually, she even gave up driving.

Jeff Tweedy and Panic Disorder
Founder of the alternative rock band Wilco, Jeff Tweedy has suffered from severe panic attacks for years. Tweedy (2008) explains the vicious cycle that underlies panic disorder: "You'll have an actual panic attack and for weeks or months after that you'll have a fear of a panic attack that can heighten your anxiety and heighten your stress levels to the point where you end up having another panic attack." After psychological treatment, Tweedy is now better able to manage his symptoms of panic disorder.



Joe Kohen/Wireimage for New York Post/Getty Images

Explaining Panic Disorder

People with panic disorder are often hypersensitive to the signs of physical arousal (Schmidt & Keough, 2010; Zvolensky & Smits, 2008). The fluttering heartbeat or momentary dizziness that the average person barely notices signals disaster to the panic-prone. David Barlow and his colleagues (2007) suggested that this oversensitivity to physical arousal is one of three important factors in the development of panic disorder. Their *triple vulnerabilities model* of panic states that a biological predisposition toward anxiety, a low sense of control over potentially life-threatening events,

and an oversensitivity to physical sensations combine to make a person vulnerable to panic (Craske & Barlow, 2008).

People with panic disorder may also be victims of their own illogical thinking. According to the *catastrophic cognitions theory,* people with panic disorder are not only oversensitive to physical sensations, they also tend to *catastrophize* the meaning of their experience (Good & Hinton, 2009; Hinton & Hinton, 2009). A few moments of increased heart rate after climbing a flight of stairs is misinterpreted as the warning signs of a heart attack. Such catastrophic misinterpretations simply add to the physiological arousal, creating a vicious circle in which the frightening symptoms intensify. After such occurrences, the person may become even more attuned to the physical changes that could signal the onset of another frightening attack. Ironically, this sensitivity only increases the likelihood that another panic attack will occur.

Syndromes resembling panic disorder have been reported in many cultures (Chentsova-Dutton & Tsai, 2007; Hinton & Hinton, 2009). For example, the Spanish phrase *ataque de nervios* literally means "attack of nerves." It's a disorder reported in many Latin American cultures, in Puerto Rico, and among Latinos in the United States. *Ataque de nervios* has many symptoms in common with panic disorder—heart palpitations, dizziness, and the fear of dying, going crazy, or losing control. However, the person experiencing *ataque de nervios* also becomes hysterical. She may scream, swear, strike out at others, and break things. *Ataque de nervios* typically follows a severe stressor, especially one involving a family member. Funerals, accidents, or family conflicts often trigger such attacks. Because *ataque de nervios* tends to elicit immediate social support from others, it seems to be a culturally shaped, acceptable way to respond to severe stress.

phobia A persistent and irrational fear of a specific object, situation, or activity.

specific phobia An excessive, intense, and irrational fear of a specific object, situation, or activity that is actively avoided or endured with marked anxiety.

The Phobias

Fear and Loathing

A **phobia** is a persistent and irrational fear of a specific object, situation, or activity. In the general population, *mild* irrational fears that don't significantly interfere with a person's ability to function are very common. Many people are fearful of certain animals, such as dogs or snakes, or are moderately uncomfortable in particular situations, such as flying in a plane or riding in a glass elevator. Nonetheless, many people cope with such fears without being overwhelmed with anxiety. As long as the fear doesn't interfere with their daily functioning, they would not be diagnosed with a psychological disorder.

In comparison, people with **specific phobia,** formerly called *simple phobia,* are more than just terrified of a particular object or situation. In some people, encountering the feared situation or object can provoke a full-fledged panic attack. Importantly, the incapacitating terror and anxiety interfere with the person's ability to function in daily life. Even though he knows that his fear is excessive and irrational, the person will go to great lengths to avoid the feared object or situation. Consider the case of Antonio, who has a phobia of dogs. He works in a pizza parlor, making pizzas and taking orders. He could make more money if he took a job as a delivery person, but he won't even consider it because he is too afraid he might encounter a dog while making deliveries.

About 13 percent of the general population experiences a specific phobia at some time in their lives (Kessler & others, 2005a). More than twice as many women as men suffer from specific phobia. Occasionally, people have unusual phobias, such as the elderly woman that Don knew who was terrified of household cleaning



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TABLE 14.2

Some Unusual Phobias

Amathophobia	Fear of dust
Anemophobia	Fear of wind
Aphephobia	Fear of being touched by another person
Bibliophobia	Fear of books
Catotrophobia	Fear of breaking a mirror
Ergophobia	Fear of work or responsibility
Erythrophobia	Fear of red objects
Gamophobia	Fear of marriage
Hypertrichophobia	Fear of growing excessive amounts of body hair
Levophobia	Fear of things being on the left side of your body
Phobophobia	Fear of acquiring a phobia
Phonophobia	Fear of the sound of your own voice
Triskaidekaphobia	Fear of the number 13

supplies (see Table 14.2). Generally, the objects or situations that produce specific phobias tend to fall into four categories:

- Fear of particular situations, such as flying, driving, tunnels, bridges, elevators, crowds, or enclosed places
- Fear of features of the natural environment, such as heights, water, thunderstorms, or lightning
- Fear of injury or blood, including the fear of injections, needles, and medical or dental procedures
- Fear of animals and insects, such as snakes, spiders, dogs, cats, slugs, or bats

Social Phobia

Fear of Social Situations

A second type of phobia also deserves additional comment—**social phobia.** Also called **social anxiety disorder,** social phobia is one of the most common psychological disorders and is more prevalent among women than men (Altemus, 2006; Kessler & others, 2005b). Social phobia goes well beyond the shyness that everyone sometimes feels at social gatherings. Rather, the person with social phobia is paralyzed by fear of social situations, especially if the situation involves performing even routine behaviors in front of others. Eating a meal in public, making small talk at a party, or using a public restroom can be agonizing for the person with social phobia.

The core of social phobia seems to be an irrational fear of being embarrassed, judged, or critically evaluated by others. People with social phobia recognize that their fear is excessive and unreasonable, but they still approach social situations with tremendous anxiety (Hofmann & Otto, 2008). In severe cases, they may even suffer a panic attack in social situations. When the fear of being embarrassed or failing in public significantly interferes with daily life, it qualifies as social phobia (DSM-IV-TR, 2000).

As with panic attacks, cultural influences can add some novel twists to social phobia. Consider the Japanese disorder called *taijin kyofusho*. *Taijin kyofusho* usually affects young Japanese males. It has several features in common with social phobia, including extreme social anxiety and avoidance of social situations. However, the person with *taijin kyofusho* is not worried about being embarrassed in public. Rather, reflecting the cultural emphasis of concern for others, the person with *taijin kyofusho* fears that his appearance or smell, facial expression, or body language will offend, insult, or embarrass other people (Iwamasa, 1997).

Social Phobia About one out of eight adults in the United States has experienced social phobia at some point in their lives (Kessler & others, 2005a). Social phobia is far more debilitating than everyday shyness. People with social phobia are intensely fearful of being watched or judged by others. Even ordinary activities, such as eating lunch in a public café, can cause unbearable anxiety.



Hemis/Alamy

Explaining Phobias

Learning Theories

The development of some phobias can be explained in terms of basic learning principles (Craske & Waters, 2005). *Classical conditioning* may well be involved in the development of a specific phobia that can be traced back to some sort of traumatic event. In Chapter 5, on learning, we saw how psychologist John Watson classically conditioned "Little Albert" to fear a tame lab rat that had been paired with loud noise. Following the conditioning, the infant's fear generalized to other furry objects. In much the same way, our neighbor Michelle has been extremely phobic of dogs ever since she was bitten by a German shepherd when she was 4 years old. In effect, Michelle developed a *conditioned response* (fear) to a *conditioned stimulus* (the German shepherd) that has *generalized* to similar stimuli—any dog.

Operant conditioning can also be involved in the avoidance behavior that characterizes phobias. In Michelle's case, she quickly learned that she could reduce her anxiety and fear by

avoiding dogs altogether. To use operant conditioning terms, her *operant response* of avoiding dogs is *negatively reinforced* by the relief from anxiety and fear that she experiences.

Observational learning can also be involved in the development of phobias. Some people learn to be phobic of certain objects or situations by observing the fearful reactions of someone else who acts as a *model* in the situation. The child who observes a parent react with sheer panic to the sight of a spider or mouse may imitate the same behavioral response. People can also develop phobias from observing vivid media accounts of disasters, as when some people become afraid to fly after watching graphic TV coverage of a plane crash.

We also noted in Chapter 5 that humans seem *biologically prepared* to acquire fears of certain animals or situations, such as snakes or heights, that were survival threats in human evolutionary history (Workman & Reader, 2008). People also seem to be predisposed to develop phobias toward creatures that arouse disgust, like slugs, maggots, or cockroaches. Instinctively, it seems, many people find such creatures repulsive, possibly because they are associated with disease, infection, or filth. Such phobias may reflect a fear of contamination or infection that is also based on human evolutionary history (Cisler & others, 2007).





Yuck! It's hard to suppress a shudder of disgust at the sight of a slug sliming its way across the sidewalk . . . or a cockroach scuttling across the kitchen floor. Are such responses instinctive? Why are people more likely to develop phobias for slugs, maggots, and cockroaches than for mosquitoes or grasshoppers?

(left) Stockphoto
(right) Punchstock

Post-Traumatic Stress Disorder

Reexperiencing the Trauma

KEY THEME

› Extreme anxiety and intrusive thoughts are symptoms of both post-traumatic stress disorder (PTSD) and obsessive-compulsive disorder (OCD).

KEY QUESTIONS

› What is PTSD, and what causes it?
› What is obsessive-compulsive disorder?
› What are the most common types of obsessions and compulsions?

Post-traumatic stress disorder (PTSD) is a long-lasting anxiety disorder that develops in response to an extreme physical or psychological trauma. Extreme traumas are events that produce intense feelings of horror and helplessness, such as a serious physical injury or threat of injury to yourself or to loved ones.

Originally, post-traumatic stress disorder was primarily associated with direct experiences of military combat. Veterans of military conflict in Afghanistan and Iraq, like veterans of earlier wars, have a higher prevalence of PTSD than nonveterans (E. Cohen & others, 2011; Fontana & Rosenheck, 2008). However, it's now known that PTSD can *also* develop in survivors of other sorts of extreme traumas, such as natural disasters,

social phobia or **social anxiety disorder**
An anxiety disorder involving the extreme and irrational fear of being embarrassed, judged, or scrutinized by others in social situations.

post-traumatic stress disorder (PTSD)
An anxiety disorder in which chronic and persistent symptoms of anxiety develop in response to an extreme physical or psychological trauma.



Chris Hondros/Getty Images

Invisible Wounds: PTSD Among Iraqi and Afghanistan Veterans
Infantry scout Jesus Bocanegra witnessed firsthand suffering and death in Iraq. After returning, Bocanegra suffered from frequent flashbacks, nightmares, nervousness, and felt emotionally numb. Like Bocanegra, some 300,000 veterans have been diagnosed with PTSD or major depression (Tanielian, 2008). The high rate of PTSD and suicide may be related to unique aspects of the Iraq and Afghanistan conflicts. As Veterans Affairs physician Nancy Seal observes, "The majority of military personnel experience high-intensity guerrilla warfare and the chronic threat of roadside bombs and improvised explosive devices. Some soldiers endure multiple tours of duty, many experience traumatic injury, and more of the wounded survive than ever before" (Seal & others, 2007).



Andy Sewell/Getty Images

The Ravages of War: Child Soldiers

An estimated quarter-million children serve as unwilling combatants in wars today, most of them kidnapped from their families and forced to serve as soldiers. Child soldiers not only suffer torture and violence, they are also often forced to commit atrocities against others. Not surprisingly, these children suffer from very high rates of post-traumatic stress disorder (Bayer & others, 2007; Kohrt & others, 2008). One survey of former child soldiers in refugee camps in Uganda found that 97 percent of the children suffered from PTSD symptoms (see Dawson, 2007; Derluyn & others, 2004). Rehabilitation centers have been established throughout Uganda and the Democratic Republic of Congo, where many of these children live, but more assistance is desperately needed (Ursano & Shaw, 2007).

physical or sexual assault, random shooting sprees, or terrorist attacks (McNally, 2003). Rescue workers, relief workers, and emergency service personnel can also develop PTSD symptoms (Eriksson & others, 2001). Simply witnessing the injury or death of others can be sufficiently traumatic for PTSD to occur.

In any given year, it's estimated that more than 5 million American adults experience PTSD. There is also a significant gender difference—more than twice as many women as men experience PTSD after exposure to trauma (Olff & others, 2007). Children can also experience the symptoms of PTSD (Kaplow & others, 2006).

Three core symptoms characterize post-traumatic stress disorder (DSM-IV-TR, 2000). First, the person *frequently recalls the event,* replaying it in her mind. Such recollections are often *intrusive,* meaning that they are unwanted and interfere with normal thoughts. Second, the person avoids *stimuli* or *situations* that tend to trigger memories of the experience and undergoes a general *numbing of emotional responsiveness.* Third, the person experiences the *increased physical arousal* associated with anxiety. He may be easily startled, experience sleep disturbances, have problems concentrating and remembering, and be prone to irritability or angry outbursts (North & others, 2009).

Post-traumatic stress disorder is somewhat unusual in that the source of the disorder is the traumatic event itself, rather than a cause that lies within the individual. Even well-adjusted and psychologically healthy people may develop PTSD when exposed to an extremely traumatic event (Ozer & others, 2003).

Terrorist attacks, because of their suddenness and intensity, are particularly likely to produce post-traumatic stress disorder in survivors, rescue workers, and observers (Neria & others, 2011). For example, four years after the bombing of the Murrah Building in Oklahoma City, more than a third of the survivors suffered from post-traumatic stress disorder. Almost all the survivors had some PTSD symptoms, such as flashbacks, nightmares, intrusive thoughts, and anxiety (North & others, 1999). Similarly, five years after the 9/11 terrorist attacks, more than 11 percent of rescue and recovery workers met formal criteria for PTSD—a rate comparable to that of soldiers returning from active duty in Iraq and Afghanistan (Stellman & others, 2008). Among people who had directly witnessed the attacks, over 16 percent had PTSD symptoms four years after the attacks (Farfel & others, 2008; Jayasinghe & others, 2008).

However, it's also important to note that no stressor, no matter how extreme, produces post-traumatic stress disorder in everyone. Why is it that some people develop PTSD while others don't? Several factors influence the likelihood of developing post-traumatic stress disorder. First, people with a personal or family history of psychological disorders are more likely to develop PTSD when exposed to an extreme trauma (Amstadter & others, 2009; Koenen & others, 2008). Second, the magnitude of the trauma plays an important role. More extreme stressors are more likely to produce PTSD. Finally, when people undergo *multiple* traumas, the incidence of PTSD can be quite high.

Obsessive–Compulsive Disorder

Checking It Again . . . and Again

When you leave your home, you probably check to make sure all the doors are locked. You may even double-check just to be on the safe side. But once you're confident that the door is locked, you don't think about it again.

Now imagine you've checked the door *30* times. Yet you're still not quite sure that the door is really locked. You know the feeling is irrational, but you feel compelled to check again and again. Imagine you've *also* had to repeatedly check that the coffeepot was unplugged, that the stove was turned off, and so forth. Finally, imagine that you got only two blocks away from home before you felt compelled to turn back and check *again*—because you still were not certain.

Sound agonizing? This is the psychological world of the person who suffers from one form of obsessive–compulsive disorder. **Obsessive–compulsive disorder (OCD)**

is an anxiety disorder in which a person's life is dominated by repetitive thoughts (*obsessions*) and behaviors (*compulsions*).

Obsessions are repeated, intrusive, uncontrollable thoughts or mental images that cause the person great anxiety and distress. Obsessions are not the same as everyday worries. Normal worries typically have some sort of factual basis, even if they're somewhat exaggerated. In contrast, obsessions have little or no basis in reality and are often extremely far-fetched. One common obsession is an irrational fear of dirt, germs, and other forms of contamination. Another common theme is pathological doubt about having accomplished a simple task, such as shutting off appliances (Antony & others, 2007; Renshaw & others, 2010).

A **compulsion** is a repetitive behavior that a person feels driven to perform. Typically, compulsions are ritual behaviors that must be carried out in a certain pattern or sequence. Compulsions may be *overt physical behaviors,* such as repeatedly washing your hands, checking doors or windows, or entering and reentering a doorway until you walk through exactly in the middle. Or they may be *covert mental behaviors,* such as counting or reciting certain phrases to yourself. But note that the person does not compulsively wash his hands because he enjoys being clean. Rather, he washes his hands because to *not* do so causes extreme anxiety. If the person tries to resist performing the ritual, unbearable tension, anxiety, and distress result (Mathews, 2009).

Obsessions and compulsions tend to fall into a limited number of categories. About three-fourths of obsessive–compulsive patients suffer from multiple obsessions, and slightly more than half report more than one type of compulsion (Rasmussen & Eisen, 1992). The most common obsessions and compulsions are shown in Table 14.3.

Many people with obsessive–compulsive disorder have the irrational belief that failure to perform the ritual action will lead to a catastrophic or disastrous outcome (MacDonald & Davey, 2005). Recent research suggests that many people with OCD,



Getty Images

Howard Hughes and Obsessive–Compulsive Disorder Shown at the controls of his "Spruce Goose" aircraft, Hughes was an extraordinary aviator, engineer, inventor, and film producer and director. But Hughes was also tormented by his obsessive fear of germs, which could be traced back to his childhood. Hughes's mother was constantly fearful that her son would catch polio or be sickened by germs. As an adult, Hughes developed increasingly extreme and bizarre compulsions, such as sitting naked for weeks in "germ free zones" in darkened hotel rooms and wearing tissue boxes on his feet. By the time Hughes died, he was a mentally ill recluse, emaciated, and a drug addict (Bartlett & Steele, 2004; Dittman, 2005).

TABLE 14.3

The Most Common Obsessions and Compulsions

Obsession	Description
Contamination	Irrational fear of contamination by dirt, germs, or other toxic substances. Typically accompanied by cleaning or washing compulsion.
Pathological doubt	Feeling of uncertainty about having accomplished a simple task. Recurring fear that you have inadvertently harmed someone or violated a law. Typically accompanied by checking compulsion.
Violent or sexual thoughts	Fear that you have harmed or will harm another person or have engaged or will engage in some sort of unacceptable behavior. May take the form of intrusive mental images or impulses.
Compulsion	**Description**
Washing	Urge to repeatedly wash yourself or clean your surroundings. Cleaning or washing may involve an elaborate, lengthy ritual. Often linked with contamination obsession.
Checking	Checking repeatedly to make sure that a simple task has been accomplished. Typically occurs in association with pathological doubt. Checking rituals may take hours.
Counting	Need to engage in certain behaviors a specific number of times or to count to a certain number before performing some action or task.
Symmetry and precision	Need for objects or actions to be perfectly symmetrical or in an exact order or position. Need to do or undo certain actions in an exact fashion.

Source: Based on Rasmussen & Eisen (1992), Table 1, p. 745.

■ **obsessive–compulsive disorder (OCD)** An anxiety disorder in which the symptoms of anxiety are triggered by intrusive, repetitive thoughts and urges to perform certain actions.

■ **obsessions** Repeated, intrusive, and uncontrollable irrational thoughts or mental images that cause extreme anxiety and distress.

■ **compulsions** Repetitive behaviors or mental acts that are performed to prevent or reduce anxiety.

especially those with checking or counting compulsions, are particularly prone to superstitious or "magical" thinking (Einstein & Menzies, 2004). Even though the person knows that his obsessions are irrational or his compulsions absurd, he is unable to resist their force.

People may experience either obsessions or compulsions. More commonly, obsessions and compulsions are *both* present. Often, the obsessions and compulsions are linked in some way. For example, a man who was obsessed with the idea that he might have lost an important document felt compelled to pick up every scrap of paper he saw on the street and in other public places.

Other compulsions bear little logical relationship to the feared consequences. For instance, a woman believed that if she didn't get dressed according to a strict pattern, her husband would die in an automobile accident. In all cases, people with obsessive–compulsive disorder feel that something terrible will happen if the compulsive action is left undone (Mathews, 2009).



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Interestingly, obsessions and compulsions take a similar shape in different cultures around the world. However, the *content* of the obsessions and compulsions tends to mirror the particular culture's concerns and beliefs. In the United States, compulsive washers are typically preoccupied with obsessional fears of germs and infection. But in rural Nigeria and rural India, compulsive washers are more likely to have obsessional concerns about religious purity (Rapoport, 1989; Rego, 2009).

Explaining Obsessive–Compulsive Disorder

Although the causes of obsessive–compulsive disorder are still being investigated, evidence strongly suggests that biological factors are involved (McGregor, 2009). For example, a deficiency in the neurotransmitters norepinephrine and serotonin has been implicated in obsessive–compulsive disorder. When treated with drugs that increase the availability of these substances in the brain, many OCD patients experience a marked decrease in symptoms.

In addition, obsessive–compulsive disorder has been linked with dysfunction in specific brain areas, such as areas involved in the fight-or-flight response, and the frontal lobes, which play a key role in our ability to think and plan ahead (Anderson & Savage, 2004; Woo & Keatinge, 2008). Another brain area that has been implicated is the *caudate nucleus*, which is involved in regulating movements (Guehl & others, 2008; Maia & others, 2009). Dysfunctions in these brain areas might help account for the overwhelming sense of doubt and the lack of control over thoughts and actions that are experienced in obsessive–compulsive disorder.

The anxiety disorders are summarized in Table 14.4.

TABLE 14.4

The Anxiety Disorders

General Anxiety Disorder (GAD)
- Persistent, chronic, unreasonable worry and anxiety
- General symptoms of anxiety, including persistent physical arousal

Panic Disorder
- Frequent and unexpected panic attacks, with no specific or identifiable trigger

Phobias
- Intense anxiety or panic attack triggered by a specific object or situation
- Persistent avoidance of feared object or situation

Post-Traumatic Stress Disorder (PTSD)
- Anxiety triggered by memories of a traumatic experience

Obsessive–Compulsive Disorder (OCD)
- Anxiety caused by uncontrollable, persistent, recurring thoughts (obsessions), and/or
- Anxiety caused by uncontrollable, persistent urges to perform certain actions (compulsions)

CONCEPT REVIEW 14.1

Anxiety Disorders

Match each example below with one of the following anxiety disorders: generalized anxiety disorder, panic disorder, specific phobia, post-traumatic stress disorder, obsessive-compulsive disorder, social phobia.

1. Esperanza had just entered the lobby of the World Trade Center in New York City when the building was hit by a jetliner on 9/11. Years later, she has frequent headaches and is awakened several times each week by horrifying nightmares of bodies falling from the sky. She dreads the sounds of sirens or planes overhead, and cannot stop thinking about the horrifying sights she saw as she ran from the burning building. _____, _____
2. Alayna worries about everything and can never relax. She is very jumpy, has trouble sleeping at night, and has a poor appetite. For the last few months, her anxiety has become so extreme that she is unable to concentrate at work and she is in danger of losing her job. _____
3. Ever since going through a very painful divorce, Kayla has experienced a number of terrifying "spells" that seem to come out of nowhere. Her heart suddenly starts to pound, she begins to sweat and tremble, and she has trouble breathing. _____
4. Carl cannot bear to be in small, enclosed places, such as elevators, and goes to great lengths to avoid them. Recently he turned down a high-paying job with an air-conditioning repair company because it involved working in crawl spaces. _____
5. Harry disinfects his shoes, clothing, floor, and doorknobs with bleach several times a day. Nevertheless, he is tormented by worries that his apartment may be contaminated by germs from outside. He doesn't allow anyone to come into his apartment for fear they will contaminate his furniture and belongings. _____
6. Kathy is so painfully shy that she dropped out of college rather than take a public-speaking class. Although she is very bright and hardworking, she is unemployed because she cannot bring herself to go to a job interview. _____

Mood Disorders

Emotions Gone Awry

KEY THEME

› In mood disorders, including major depression and bipolar disorder, disturbed emotions cause psychological distress and impair daily functioning.

KEY QUESTIONS

› What are the symptoms and course of major depression, dysthymic disorder, bipolar disorder, and cyclothymic disorder?

› How prevalent are mood disorders?

› What factors contribute to the development of mood disorders?

Let's face it, we all have our ups and downs. When things are going well, we feel cheerful and optimistic. When events take a more negative turn, our mood can sour. We feel miserable and pessimistic. Either way, the intensity and duration of our moods are usually in proportion to the events going on in our lives. That's completely normal.

In mood disorders, however, emotions violate the criteria of normal moods. In quality, intensity, and duration, a person's emotional state does not seem to reflect what's going on in his or her life. A person may feel a pervasive sadness despite the best of circumstances. Or a person may be extremely energetic and overconfident with no apparent justification. These mood changes persist much longer than the normal fluctuations in moods that we all experience.

DSM-IV-TR formally defines a **mood disorder** as a serious, persistent disturbance in a person's emotions that causes psychological discomfort, impairs the ability to function, or both. Mood disorders are also often called *affective disorders*. The word "affect" is synonymous with "emotion" or "feelings." In this section, we'll look at the two most important mood disorders: major depression and bipolar disorder.

mood disorders A category of mental disorders in which significant and persistent disruptions in mood or emotions cause impaired cognitive, behavioral, and physical functioning; also called *affective disorders*.



Frank Micelotta/Getty Images

Kurt Cobain As leader of the alternative rock band Nirvana, Kurt Cobain seemed to have everything: fame, artistic recognition, wealth, and adulation from both fans and music critics. But Cobain also had a history of troubling episodes of deep depression and had attempted suicide several times. Despite his status as an alternative rock icon, Cobain's thoughts reflected the negative bias that is common in people gripped by severe depression. In his suicide note, Cobain described himself as "just another miserable, self-destructive death rocker." Cobain died of a shotgun wound to the head at the age of 27.

Major Depression

More Than Ordinary Sadness

The intense psychological pain of **major depression** is hard to convey to those who have never experienced it. In his book *Darkness Visible,* best-selling author William Styron (1990) described his struggle with major depression in this way:

> All sense of hope had vanished, along with the idea of a futurity; my brain, in thrall to its outlaw hormones, had become less an organ of thought than an instrument registering, minute by minute, varying degrees of its own suffering. The mornings themselves were becoming bad now as I wandered about lethargic, following my synthetic sleep, but afternoons were still the worst, beginning at about three o'clock, when I'd feel the horror, like some poisonous fogbank, roll in upon my mind, forcing me into bed. There I would lie for as long as six hours, stuporous and virtually paralyzed, gazing at the ceiling. . . .

The Symptoms of Major Depression

The Styron passage gives you a feeling for how the symptoms of depression affect the whole person—emotionally, cognitively, behaviorally, and physically. Take a few minutes to study Figure 14.3, which summarizes the common symptoms of major depression. Depression is also often accompanied by the physical symptoms of anxiety (Klein & others, 2008; Andover & others, 2011). Some depressed people experience a sense of physical restlessness or nervousness, demonstrated by fidgeting or aimless pacing.

Suicide is always a potential risk in major depression (Brådvik & Berglund, 2010). Thoughts become globally pessimistic and negative about the self, the world, and the future (Hammen & Watkins, 2008). This pervasive negativity and pessimism are often manifested in suicidal thoughts or a preoccupation with death. Approximately 10 percent of those suffering from major depression attempt suicide (McGirr & others, 2007).

Abnormal sleep patterns are another hallmark of major depression. The amount of time spent in nondreaming, deeply relaxed sleep is greatly reduced or absent (see Chapter 4). Rather than the usual 90-minute cycles of dreaming, the person experiences sporadic REM periods of varying lengths. Spontaneous awakenings occur repeatedly during the night. Very commonly, the depressed person awakens at 3:00 or 4:00 A.M., then cannot get back to sleep, despite feeling exhausted. Less commonly, some depressed people sleep excessively, sometimes as much as 18 hours a day.

FIGURE 14.3 The Symptoms of Major Depression The experience of major depression can permeate every aspect of life. This figure shows some of the most common emotional, behavioral, cognitive, and physical symptoms of that disorder.



To be diagnosed with major depression, a person must display most of the symptoms described for two weeks or longer (DSM-IV-TR, 2000). In many cases, there doesn't seem to be any external reason for the persistent feeling of depression. In other cases, a person's downward emotional spiral has been triggered by a negative life event, stressful situation, or chronic stress (Gutman & Nemeroff, 2011).

One significant negative event deserves special mention: the death of a loved one. If a family member or close friend dies, it is completely normal to feel despondent and sad for several months as part of the mourning or bereavement process. Even so, most people resume attending to the routine duties of life within a few weeks. Privately, they may still feel a strong sense of loss, but they function adequately, if not optimally. As a general rule, if a person's ability to function after the death of a loved one is still seriously impaired after two months, major depression is suspected (DSM-IV-TR, 2000).

Although major depression can occur at any time, some people experience symptoms that intensify at certain times of the year. For people with **seasonal affective disorder (SAD),** repeated episodes of major depression are as predictable as the changing seasons, especially the onset of autumn and winter when there is the least amount of sunlight. Seasonal affective disorder is more common among women and among people who live in the northern latitudes (Partonen & Pandi-Perumal, 2010).

Dysthymic Disorder

In contrast to major depression, which significantly impairs a person's ability to function, some people experience a less severe form of depression called *dysthymic disorder*. Briefly, **dysthymic disorder** is chronic, low-grade depression. It's characterized by many of the symptoms of depression, but the symptoms are less intense. Usually, dysthymic disorder develops in response to some stressful event or trauma. Rather than improving over time, however, the negative mood persists indefinitely. Although the person functions adequately, she has a chronic case of "the blues" that can continue for years. The DSM-IV-TR criteria regarding duration of symptoms are a good indicator of the difference between major depression and dysthymic disorder: Major depression requires symptoms to be present for at least two weeks, while dysthymic disorder requires two years.

The Prevalence and Course of Major Depression

Major depression is often called "the common cold" of psychological disorders, and for good reason: It is among the most prevalent psychological disorders. In any given year, about 7 percent of Americans are affected by major depression (Kessler & others, 2005b). In terms of lifetime prevalence, about 15 percent of Americans will be affected by major depression at some point in their lives.

Women are about twice as likely as men to be diagnosed with major depression (Hammen & Watkins, 2008). Why the striking gender difference in the prevalence of major depression? Research by psychologist Susan Nolen-Hoeksema (2001, 2003) suggests that women are more vulnerable to depression because they experience a greater degree of chronic stress in daily life combined with a lesser sense of personal control than men. Women are also more prone to dwell on their problems, adding to the sense of low mastery and chronic strain in their lives. The interaction of these factors creates a vicious circle that intensifies and perpetuates depressed feelings in women (Nolen-Hoeksema & Hilt, 2009; Nolen-Hoeksema & others, 2007).

Many people who experience major depression try to cope with the symptoms without seeking professional help (Edlund & others, 2008; Kessler & others, 2003). Left untreated, the symptoms of major depression can easily last six months or longer. When not treated, depression may become a recurring mental disorder that becomes progressively more severe. More than half of all people who have been through one episode of major depression can expect a relapse, usually within two years. With each recurrence, the symptoms tend to increase in severity and the time between major depression episodes decreases (Hammen, 2005).



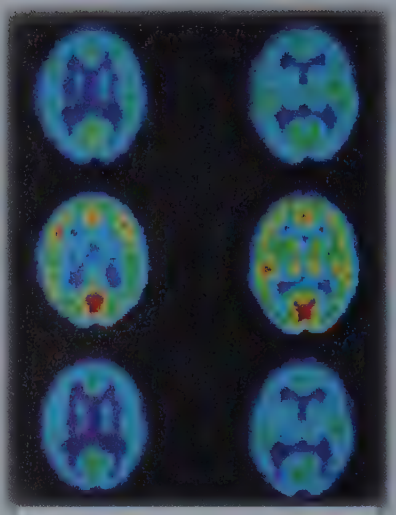
Sheryl Crow Grammy award-winning singer Sheryl Crow has struggled with depression since she was a young child. Of her chronic depression, she has said, "I grew up in the presence of melancholy, a feeling of loss.... It is a shadow for me. It's part of who I am. It is constantly there. I just know how, at this point, to sort of manage it."

Reuters/Brendan McDermid

major depression A mood disorder characterized by extreme and persistent feelings of despondency, worthlessness, and hopelessness, causing impaired emotional, cognitive, behavioral, and physical functioning.

seasonal affective disorder (SAD) A mood disorder in which episodes of depression typically occur during the fall and winter and subside during the spring and summer.

dysthymic disorder (dis-THY-mick) A mood disorder involving chronic, low-grade feelings of depression that produce subjective discomfort but do not seriously impair the ability to function.



©1996, American Medical Association from Archives of General Psychiatry, February 1996, Vol. 53. Courtesy of Jeffrey M. Schwartz

Brain Activity During the Extremes of Bipolar Disorder
These PET scans record the brain activity of an individual with bipolar disorder as he cycled rapidly from depression to mania and back to depression over a 10-day period. In the top and bottom PET scans, the blue and green colors clearly show the sharp reduction in overall brain activity that coincided with the episodes of depression. In the center PET scans, the bright red, orange, and yellow colors indicate high levels of activity in diverse brain regions during the intervening episodes of mania.

Source: Lewis Baxter and Michael E. Phelps, UCLA School of Medicine

Bipolar Disorder

An Emotional Roller Coaster

Years ago, your author Don worked in the psychiatric ward of a large hospital. As Don arrived for work early one morning and headed for the nurses' station, a tall, overweight young man with black curly hair *zoomed* across the ward and intercepted him.

"Hi! My name's Kelly! What's yours?" he enthusiastically boomed, vigorously shaking hands. But before Don could respond, Kelly had already moved on to new topics. Within the next 90 seconds, Don heard about (1) Kelly's plans to make millions of dollars organizing garage sales for other people; (2) several songs that Kelly had written that were all going to skyrocket to the top of the music charts; (3) Kelly's many inventions; and (4) a variety of movie stars, rock stars, and professional athletes, all of whom were Kelly's close friends.

Kelly spoke so rapidly that his words often got tangled up with each other. His arms and legs looked as if they were about to get tangled up, too—Kelly was in constant motion. His grinning, rapid-fire speech was punctuated with grand, sweeping gestures and exaggerated facial expressions. Before Don could get a word in edgewise, Kelly vigorously shook his hand again and *zoomed* to the other side of the psychiatric ward to intercept another stranger.

The Symptoms of Bipolar Disorder

Kelly displayed classic symptoms of the mental disorder that used to be called *manic depression* and is today called **bipolar disorder.** In contrast to major depression, bipolar disorder almost always involves abnormal moods at *both* ends of the emotional spectrum. In most cases of bipolar disorder, the person experiences extreme mood swings. Episodes of incapacitating depression alternate with shorter periods of extreme euphoria, called **manic episodes.** For most people with bipolar disorder, a manic episode immediately precedes or follows a bout with major depression. However, a small percentage of people with bipolar disorder experience only manic episodes (DSM-IV-TR, 2000).

Manic episodes typically begin suddenly, and symptoms escalate rapidly. During a manic episode, people are uncharacteristically euphoric, expansive, and excited for several days or longer. Although they sleep very little, they have boundless energy. The person's self-esteem is wildly inflated, and he exudes supreme self-confidence. Often, he has grandiose plans for obtaining wealth, power, and fame (Carlson & Meyer, 2006; Miklowitz, 2008). Sometimes the grandiose ideas represent *delusional,* or false, beliefs. Kelly's belief that various celebrities were his close personal friends was delusional.



Sara Krulwich/The New York Times/Redux

Carrie Fisher and Bipolar Disorder By age 20, Fisher had become a cultural icon in her role as Princess Leia in George Lucas's *Star Wars* trilogy. By age 24, Fisher was grappling with drug addiction and bipolar disorder. Today, Fisher is a successful actress and writer. Her critically acclaimed one-woman Broadway show, *Wishful Drinking,* is a funny yet bluntly honest memoir of her struggles. During her performance, Fisher displays her photo as it appears in an abnormal psychology textbook. Fisher prefers the older term, *manic-depression,* because, she quips, "It describes what it's like. Bipolar sounds like a gay bear from Alaska." Fisher manages her symptoms with a combination of medication and electroconvulsive therapy, which we discuss in Chapter 15.

Kelly's fast-forward speech was loud and virtually impossible to interrupt. During a manic episode, words are spoken so rapidly, they're often slurred as the person tries to keep up with his own thought processes. The manic person feels as if his thoughts are racing along at warp factor 10. Attention is easily distracted by virtually anything, triggering a *flight of ideas,* which thoughts rapidly and loosely shift from topic to topic.

Not surprisingly, the ability to function during a manic episode is severely

impaired. Hospitalization is usually required, partly to protect people from the potential consequences of their inappropriate decisions and behaviors. During manic episodes, people can also run up a mountain of bills, disappear for weeks at a time, become sexually promiscuous, or commit illegal acts. Very commonly, the person becomes agitated or verbally abusive when others question his grandiose claims (Miklowitz & Johnson, 2007).

Some people experience a milder but chronic form of bipolar disorder called cyclothymic disorder. In **cyclothymic disorder,** people experience moderate but frequent mood swings for two years or longer. These mood swings are not severe enough to qualify as either bipolar disorder or major depression. Often, people with cyclothymic disorder are perceived as being extremely moody, unpredictable, and inconsistent.

bipolar disorder A mood disorder involving periods of incapacitating depression alternating with periods of extreme euphoria and excitement; formerly called *manic depression.*

manic episode A sudden, rapidly escalating emotional state characterized by extreme euphoria, excitement, physical energy, and rapid thoughts and speech.

cyclothymic disorder (si-klo-THY-mick) A mood disorder characterized by moderate but frequent mood swings that are not severe enough to qualify as bipolar disorder.

The Prevalence and Course of Bipolar Disorder

As in Kelly's case, the onset of bipolar disorder typically occurs in the person's early 20s. The extreme mood swings of bipolar disorder tend to start and stop much more abruptly than the mood changes of major depression. And while an episode of major depression can easily last for six months or longer, the manic and depressive episodes of bipolar disorder tend to be much shorter—lasting anywhere from a few days to a couple of months (Bowden, 2005).

Bipolar disorder is far less common than major depression. Unlike major depression, there are no differences between the sexes in the rate at which bipolar disorder occurs. For both men and women, the lifetime risk of developing bipolar disorder is about 1 percent (Miklowitz & Johnson, 2007). Bipolar disorder is rarely diagnosed in childhood. Some evidence suggests that children who display unusually unstable moods are more likely to be diagnosed with bipolar disorder in adulthood (Blader & Carlson, 2008).

In the vast majority of cases, bipolar disorder is a recurring mental disorder (Jones & Tarrier, 2005). A small percentage of people with bipolar disorder display *rapid cycling,* experiencing four or more manic or depressive episodes every year (Marneros & Goodwin, 2005). More commonly, bipolar disorder tends to recur every couple of years. Often, bipolar disorder recurs when the individual stops taking *lithium,* a medication that helps control the disorder.

Creativity and Mood Disorders

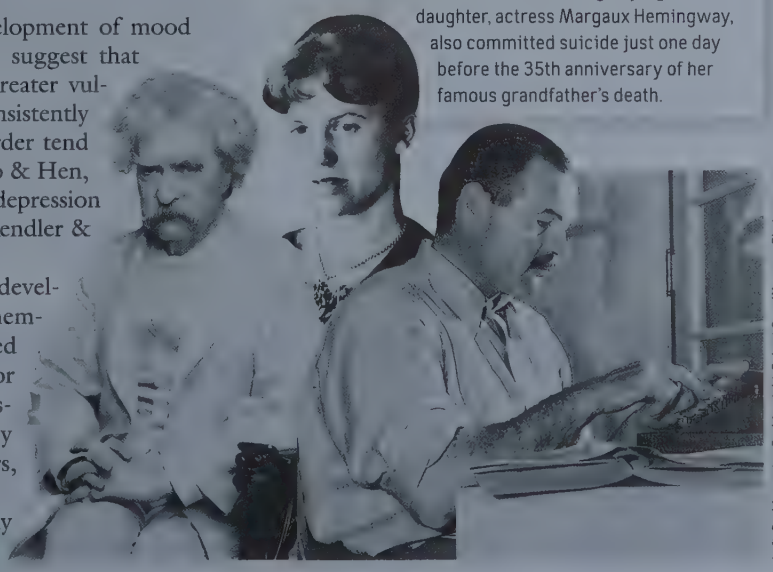
Mood disorders occur more frequently among creative writers and artists than among the general population, leading some researchers to propose a biochemical or genetic link between mood disorders and the artistic temperament (Jamison, 1993). Writer Mark Twain, novelist Ernest Hemingway, and poet Sylvia Plath all suffered from severe bouts of depression throughout their lives. Both Plath and Hemingway committed suicide, as did Hemingway's father, brother, and sister. In 1996, Hemingway's granddaughter, actress Margaux Hemingway, also committed suicide just one day before the 35th anniversary of her famous grandfather's death.

Explaining Mood Disorders

Multiple factors appear to be involved in the development of mood disorders. First, family, twin, and adoption studies suggest that some people inherit a *genetic predisposition,* or a greater vulnerability, to mood disorders. Researchers have consistently found that both major depression and bipolar disorder tend to run in families (Janzing & others, 2009; Leonardo & Hen, 2005). And twin studies have shown that major depression has a strong genetic component (Levinson, 2009; Kendler & others, 2006).

A second factor that has been implicated in the development of mood disorders is disruptions in brain chemistry. Since the 1960s, several medications, called *antidepressants,* have been developed to treat major depression. In one way or another, the antidepressants seem to lift the symptoms of depression by increasing the availability of two neurotransmitters, norepinephrine and serotonin, in the brain.

Abnormal levels of another neurotransmitter may also be involved in bipolar disorder. For decades,



Left: Corbis; center: Corbis; right: Robert Capa/Magnum Photos

it's been known that the drug lithium effectively alleviates symptoms of both mania and depression. Apparently, lithium regulates the availability of a neurotransmitter called *glutamate,* which acts as an excitatory neurotransmitter in many brain areas (Dixon & Hokin, 1998). By normalizing glutamate levels, lithium helps prevent both the excesses that may cause mania and the deficits that may cause depression.

Stress is also implicated in the development of mood disorders. Major depression is often triggered by traumatic and stressful events (Gutman & Nemeroff, 2011). Exposure to recent stressful events is one of the best predictors of episodes of major depression. This is especially true for people who have experienced previous episodes of depression and who have a family history of mood disorders. But even in people with no family or personal history of mood disorders, chronic stress can produce major depression (Muscatell & others, 2009).

Finally, recent research has uncovered some intriguing links between cigarette smoking and the development of major depression and other psychological disorders (Munafo & others, 2008; Breslau & others, 2004). We explore the connection between cigarette smoking and mental illness in the Critical Thinking box "Does Smoking Cause Depression and Other Psychological Disorders?"

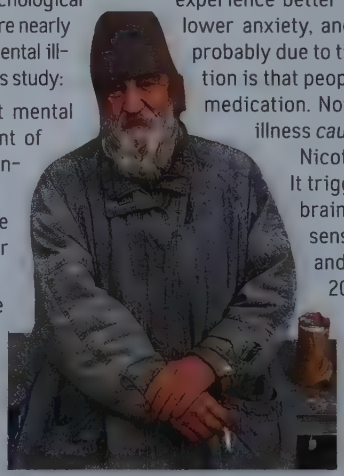
In summary, considerable evidence points to the role of genetic factors, biochemical factors, and stressful life events in the development of mood disorders (Feliciano & Arean, 2007). However, exactly how these factors interact to cause mood disorders is still being investigated. Table 14.5 summarizes the symptoms of mood disorders.

CRITICAL THINKING

Does Smoking Cause Depression and Other Psychological Disorders?

Are people with a mental disorder more likely to smoke than other people? Researcher Karen Lasser and her colleagues (2000) assessed smoking rates in American adults with and without psychological disorders. Lasser found that people with mental illness are nearly twice as likely to smoke cigarettes as people with no mental illness. Here are some of the specific findings from Lasser's study:

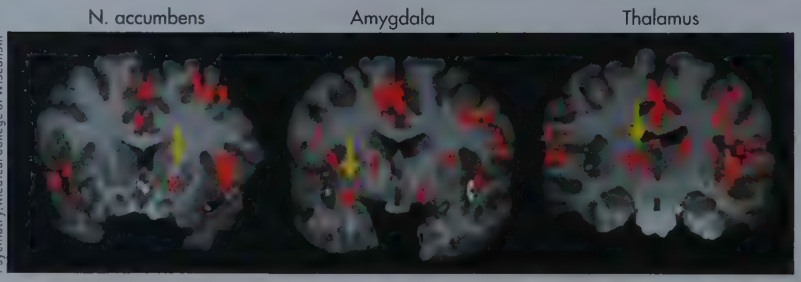
- Forty-one percent of individuals with a current mental disorder are smokers, as compared to 22 percent of people who have never been diagnosed with a mental disorder.
- People with a mental illness are more likely to be heavy smokers, consuming a pack of cigarettes per day or more.
- People who have been diagnosed with multiple mental disorders have higher rates of smoking and smoke more heavily than people with fewer mental disorders (see the graph on the next page).
- Forty-four percent of all cigarettes smoked in the United States are consumed by people with one or more mental disorders.



Jeff Greenberg/Photo Edit

What can account for the correlation between smoking and psychological disorders? Subjectively, smokers often report that they experience better attention and concentration, increased energy, lower anxiety, and greater calm after smoking, effects that are probably due to the nicotine in tobacco. So, one possible explanation is that people with a mental illness smoke as a form of self-medication. Notice that this explanation assumes that mental illness *causes* people to smoke.

Nicotine, of course, is a powerful psychoactive drug. It triggers the release of *dopamine* and stimulates key brain structures involved in producing rewarding sensations, including the *thalamus*, the *amygdala*, and the *nucleus accumbens* (Le Foll & Goldberg, 2007; Salokangas & others, 2000; Stein & others, 1998). Nicotine receptors on different neurons also regulate the release of other important neurotransmitters, including *serotonin, acetylcholine, GABA*, and *glutamate* (McGehee & others, 2007; Quattrocki & others, 2000). In other words, nicotine affects multiple brain



Courtesy of Dr. Elliot A. Stein, Dept. of Psychiatry, Medical College of Wisconsin

Nicotine's Effects in the Brain After cigarette smokers were injected with up to two milligrams of nicotine, researchers used functional magnetic resonance imaging to track the brain areas activated, which included the *nucleus accumbens*, the *amygdala*, and the *thalamus*. Previous research has shown that these brain structures produce the reinforcing, mood-elevating properties of other abused drugs, including cocaine, amphetamines, and opiates (Stein & others, 1998).

TABLE 14.5

The Mood Disorders

Major Depression

- Loss of interest or pleasure in almost all activities
- Despondent mood, feelings of emptiness, worthlessness, or excessive guilt
- Preoccupation with death or suicidal thoughts
- Difficulty sleeping or excessive sleeping
- Diminished ability to think, concentrate, or make decisions
- Diminished appetite and significant weight loss

Dysthymic Disorder

- Chronic, low-grade depressed feelings that are not severe enough to qualify as major depression

Seasonal Affective Disorder (SAD)

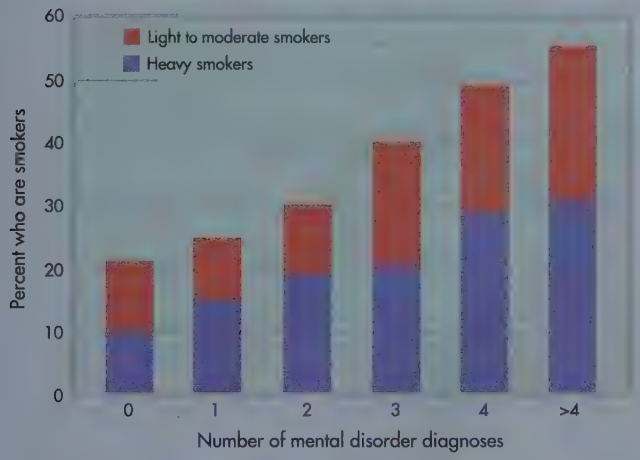
- Recurring episodes of depression that follow a seasonal pattern, typically occurring in the fall and winter months and subsiding in the spring and summer months

Bipolar Disorder

- One or more manic episodes characterized by euphoria, high energy, grandiose ideas, flight of ideas, inappropriate self-confidence, and decreased need for sleep
- Usually one or more episodes of major depression
- In some cases, may rapidly alternate between symptoms of mania and major depression

Cyclothymic Disorder

- Moderate, recurring mood swings that are not severe enough to qualify as major depression or bipolar disorder



Smoking Rates Compared to the Number of Lifetime Mental Disorder Diagnoses

Lasser & others (2000)

structures and alters the release of many different neurotransmitters. These same brain areas and neurotransmitters are also directly involved in many different mental disorders.

Although the idea that mental illness causes smoking seems to make sense, some researchers now believe that the arrow of causation points in the *opposite* direction. In the past decade, many studies have suggested that smoking triggers the onset of symptoms in people who are probably already vulnerable to the development of a mental disorder, especially major depression. Consider just a few studies:

- The lifetime prevalence of developing major depression is strongly linked to the number of cigarettes consumed (Flensborg-Madsen & others, 2011). People who smoke have nearly twice the risk of later developing major depression than non-smokers.
- Several studies focusing on adolescents found that cigarette smoking predicted the onset of depressive symptoms, rather than the other way around (Boden & others, 2010; Goodman & Capitman, 2000; Ohayon, 2007; Windle & Windle, 2001).
- In a study of people with bipolar disorder, daily cigarette smokers had worse symptoms and lengthier hospitalizations that non-smoking bipolar patients (Dodd & others, 2010).
- A positive association was found between smoking and the severity of symptoms experienced by people with anxiety disorders (McCabe & others, 2004).
- In a study of people with schizophrenia, 90 percent of the patients had started smoking *before* their illness began (Kelly & McCreadie, 1999). This suggests that smoking may precipitate an initial schizophrenic episode in vulnerable people.

Further research may help disentangle the complex interaction between smoking and mental disorders, but one fact is known: Mentally ill cigarette smokers, like other smokers, are at much greater risk of premature disability and death. So along with the psychological and personal suffering that accompanies almost all psychological disorders, the mentally ill carry the additional burden of consuming nearly half of all the cigarettes smoked in the United States.

CRITICAL THINKING QUESTIONS

- **Is the evidence sufficient to conclude that there is a causal relationship between cigarette smoking and the onset of mental illness symptoms? Why or why not?**
- **Should tobacco companies be required to contribute part of their profits to the cost of mental health treatment and research?**

Eating Disorders

Anorexia and Bulimia

KEY THEME

› The most important eating disorders are anorexia nervosa and bulimia nervosa, which are psychological disorders characterized by severely disturbed, maladaptive eating behaviors.

KEY QUESTIONS

› What are the symptoms, characteristics, and causes of anorexia nervosa?

› What are the symptoms, characteristics, and causes of bulimia nervosa?

Eating disorders involve serious and maladaptive disturbances in eating behavior. These disturbances can include extreme reduction of food intake, severe bouts of overeating, and obsessive concerns about body shape or weight (American Psychiatric Association, 2000a). The two main types of eating disorders are *anorexia nervosa* and *bulimia nervosa,* which usually begin during adolescence or early adulthood (see Table 14.6). Ninety to 95 percent of the people who experience an eating disorder are female (Støving & others, 2011). Despite the 10-to-1 gender-difference ratio, the central features of eating disorders are similar for males and females.

TABLE 14.6

Eating Disorders

Anorexia Nervosa

- Severe and extreme disturbance in eating habits and calorie intake
- Body weight that is less than 85% of what would be considered normal for the person's age, height, and gender, and refusal to maintain a normal body weight
- Intense fear of gaining weight or becoming fat
- Distorted perceptions about the severity of weight loss and a distorted self-image, such that even an extremely emaciated person may perceive herself as fat
- In females, absence of menstrual cycles

Bulimia Nervosa

- Recurring episodes of binge eating, which is defined as an excessive amount of calories within a two-hour period
- The inability to control or stop the excessive eating behavior
- Recurrent episodes of purging, which is defined as using laxatives, diuretics, self-induced vomiting, or other methods to prevent weight gain



Is Anorexia Glamorous? Erika, 26, is a patient at an eating disorders center in Italy. Despite the enormous social pressure on girls and women to be thin, there is nothing glamorous about death by heart or kidney failure. Anorexia also causes loss of hair, muscle, and teeth. Other complications include osteoporosis, loss of reproductive function, chronic fatigue, and physical weakness. Extreme malnutrition produces a fine, soft hair called *lanugo* that may cover the face, chest, arms, and back. Eating disorders are also associated with increased rates of suicide (Crow & others, 2009). For information or help, call 1-800-931-2237 or visit the National Eating Disorders Association Web site at www.nationaleatingdisorders.org

Annette Schreyer/laif/Redux

Anorexia Nervosa

Life-Threatening Weight Loss

Four key features define **anorexia nervosa.** First, the person refuses to maintain a minimally normal body weight. With a body weight that is 15 percent or more below normal, body mass index can drop to 12 or lower. Second, despite being dangerously underweight, the person with anorexia is intensely afraid of gaining weight or becoming fat. Third, she has a distorted perception about the size of her body. Although emaciated, she looks in the mirror and sees herself as fat or obese. And fourth, she denies the seriousness of her weight loss (American Psychiatric Association, 2000b).

The severe malnutrition caused by anorexia disrupts body chemistry in ways that are very similar to those caused by starvation. Basal metabolic rate decreases, as do blood levels of glucose, insulin, and leptin. Other hormonal levels drop, including the level of reproductive hormones. In women, reduced estrogen results in the menstrual cycle stopping. In males, decreased testosterone disrupts sex drive and sexual function (Pinheiro & others, 2010). Because the ability to retain body heat is greatly diminished, people with severe anorexia often develop a soft, fine body hair called *lanugo.*

Bulimia Nervosa

Bingeing and Purging

Like people with anorexia, people with **bulimia nervosa** fear gaining weight. Intense preoccupation and dissatisfaction with their bodies are also apparent. However, people with bulimia stay within a normal weight range or may even be slightly overweight. Another difference is that people with bulimia usually recognize that they have an eating disorder.

People with bulimia nervosa experience extreme periods of binge eating, consuming as many as 50,000 calories on a single binge. Binges typically occur twice a week and are often triggered by negative feelings or hunger. During the binge, the person usually consumes sweet, high-calorie foods that can be swallowed quickly, such as ice cream, cake, and candy. Binges typically occur in secrecy, leaving the person feeling ashamed, guilty, and disgusted by his own behavior. After bingeing, he compensates by purging himself of the excessive food by self-induced vomiting or by misuse of laxatives or enemas. Once he purges, he often feels psychologically relieved. Some people with bulimia don't purge themselves of the excess food. Rather, they use fasting and excessive exercise to keep their body weight within the normal range (American Psychiatric Association, 2000b).

Like anorexia nervosa, bulimia nervosa can take a serious physical toll on the body. Repeated purging disrupts the body's electrolyte balance, leading to muscle cramps, irregular heartbeat, and other cardiac problems, some potentially fatal. Stomach acids from self-induced vomiting erode tooth enamel, causing tooth decay and gum disease. Especially when practiced for long periods of time, frequent vomiting severely damages the gastrointestinal tract as well as the teeth (Powers, 2009).

eating disorder A category of mental disorders characterized by severe disturbances in eating behavior.

anorexia nervosa An eating disorder characterized by excessive weight loss, an irrational fear of gaining weight, and distorted body self-perception.

bulimia nervosa An eating disorder characterized by binges of extreme overeating followed by self-induced vomiting, misuse of laxatives, or other inappropriate methods to purge the excessive food and prevent weight gain.

Causes of Eating Disorders

A Complex Picture

Both anorexia and bulimia involve decreases in brain activity of the neurotransmitter *serotonin* (Bailer & Kaye, 2011). Disrupted brain chemistry may also contribute to the fact that eating disorders frequently co-occur with other psychiatric disorders, such as depression, substance abuse, personality disorders, and anxiety disorders, including obsessive–compulsive disorder (Thompson & others, 2007). While chemical imbalances may cause eating disorders, researchers are also studying whether they can result from them as well (Smolak, 2009).

Family interaction patterns may also contribute to eating disorders. For example, critical comments by parents or siblings about a child's weight, or parental modeling of disordered eating, may increase the odds that an individual develops an eating disorder (Thompson & others, 2007).



Agencia el Universal/El Universal de Mexico/Newscom

Size 0: An Impossible Cultural Ideal? Isabelle Caro, a famous French fashion model, died in 2010 after a decade-long struggle with anorexia. After the anorexia-related deaths of Caro and a Brazilian model, Ana Carolina Reston, France, Germany, and Spain proposed bans on ultra-thin models. But despite periodic outcries, the emaciated, skin-and-bones look continues to be the fashion industry norm. Eating disorders are most prevalent in developed, Western countries where a slender body is the cultural ideal, especially for women and girls. Many psychologists believe that such unrealistic body expectations contribute to eating disorders (Hawkins & others, 2004; Treasure & others, 2008).

Although cases of anorexia and bulimia have been documented for at least 150 years, contemporary Western cultural attitudes toward thinness and dieting probably contribute to the increased incidence of eating disorders today. This seems to be especially true with anorexia, which occurs predominantly in Western or "westernized" countries (Anderson-Eye, 2009; Cafri & others, 2005).

CONCEPT REVIEW 14.2

Mood Disorders and Eating Disorders

Fill in the blank. Choose from: bulimia nervosa; anorexia nervosa; seasonal affective disorder (SAD); dysthymic disorder; bipolar disorder; major depression; cyclothymic disorder

1. Since moving to Fairbanks, Alaska, five years ago, Jon has experienced episodes of depression during the fall and winter months. Jon may be experiencing _____.
2. Whenever she is under stress, Chelsea stops at a local grocery store and fills up her cart with ice cream, boxes of cookies, bags of chips, bakery goods, and bottles of soda. She will lock herself in her room and eat until she throws up. This occurs at least a couple of times a week. Chelsea is showing symptoms of _____.
3. Sean has always had a negative, pessimistic attitude. Even positive events don't shake his gloomy mood. Although Sean has a good job, he has few friends because they get tired of his constant complaints and negativity. Sean probably suffers from _____.
4. Adam has suddenly become euphoric and energetic, sleeping only a few hours a night. He talks constantly about his far-fetched plans for making huge amounts of money. Adam most likely has _____.
5. Brittany, a 19-year-old college student, has missed almost all her classes during the last month. She sleeps 14 hours a day, has withdrawn from friends and family, feels worthless, and cries for no apparent reason. Brittany is most likely suffering from _____.
6. Emily runs twice a day, sometimes to the point of exhaustion. Because Emily believes that she is grossly overweight, she sometimes restricts her diet to green salads and grapefruit juice, even though her body weight is well below what is considered normal for her height. Emily is displaying the symptoms of _____.
7. Mark has always been very unpredictable. One week he is lethargic and avoids all social contact, the next week he is very energetic, friendly, and outgoing. Even though his mood swings occur regularly, they are not severe enough to qualify as bipolar disorder. Mark's moodiness may well be a symptom of _____.



Personality Disorders

Maladaptive Traits

KEY THEME

› The personality disorders are characterized by inflexible, maladaptive patterns of thoughts, emotions, behavior, and interpersonal functioning.

KEY QUESTIONS

› How do people with a personality disorder differ from people who are psychologically well-adjusted?

› What are the three categories of personality disorders?

› What behaviors and personality characteristics are associated with the paranoid, antisocial, and borderline personality disorders?

Like every other person, you have your own unique *personality*—the consistent and enduring patterns of thinking, feeling, and behaving that characterize you as an individual. As we described in Chapter 11, your personality can be described as a specific collection of personality traits. Your *personality traits* are relatively stable predispositions to behave or react in certain ways. In other words, your personality traits reflect different dimensions of your personality.

personality disorder Inflexible, maladaptive patterns of thoughts, emotions, behavior, and interpersonal functioning that are stable over time and across situations, and that deviate from the expectations of the individual's culture.

By definition, personality traits are consistent over time and across situations. But that's not to say that personality traits are etched in stone. Rather, the psychologically well-adjusted person possesses a fair degree of flexibility and adaptiveness. Based on our experiences with others, we are able to modify how we display our personality traits so that we can think, feel, and behave in healthier and more appropriate ways.

In contrast, someone with a **personality disorder** has personality traits that are *inflexible* and *maladaptive* across a broad range of situations. Some researchers believe that personality disorders reflect conditions in which "normal" personality traits are taken to an abnormal extreme (Trull & Widiger, 2008; Fowler & others, 2007). However, the behavior of people with personality disorders goes well beyond that of a normal individual who occasionally experiences a meltdown or who is grumpier, more skeptical, or more careful than most people. By definition, the personality disorders involve pervasive patterns of perceiving, relating to, and thinking about the environment and the self that interfere with long-term functioning (Oltmanns & Balsis, 2011). And these maladaptive behaviors are *not* restricted to isolated episodes or specific circumstances.

Usually, personality disorders become evident during adolescence or early adulthood. These maladaptive patterns of emotions, thought processes, and behavior tend to be very stable over time. They also deviate markedly from the social and behavioral expectations of the individual's culture. Personality disorders are evident in about 10 percent of the general population (Lenzenweger, 2008).

Despite the fact that the maladaptive personality traits consistently cause personal or social turmoil, people with personality disorders may not consider their personality characteristics as being problematic. In other words, they are unable to see that their inflexible style of thinking and behaving is at the root of their personal and social difficulties. Consequently, people with personality disorders often don't seek help because they don't think they have a problem.

Ten distinct personality disorders have been identified. They are categorized into three basic clusters: *odd, eccentric* personality disorders; *dramatic, emotional, erratic* personality disorders; and *anxious, fearful* personality disorders. The key features of each personality disorder are summarized in Table 14.7. In this section, we'll focus our discussion on three of the best-known personality disorders: paranoid personality disorder, antisocial personality disorder, and borderline personality disorder.



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TABLE 14.7

Personality Disorders

Odd, Eccentric Cluster

Paranoid Personality Disorder
- Pervasive but unwarranted distrust and suspiciousness; assumes that other people intend to deceive, exploit, or harm them.

Schizoid Personality Disorder
- Pervasive detachment from social relationships; emotionally cold and flat; indifferent to praise or criticism from others.

Schizotypal Personality Disorder
- Odd thoughts, speech, emotional reactions, mannerisms, and appearance; impaired social and interpersonal functioning; often superstitious.

Dramatic, Emotional, Erratic Cluster

Antisocial Personality Disorder
- Blatantly disregards or violates the rights of others; impulsive, irresponsible, deceitful, manipulative, and lacks guilt or remorse.

Borderline Personality Disorder
- Erratic, unstable relationships, emotions, and self-image; impulsive; desperate efforts to avoid real or imagined abandonment; feelings of emptiness; self-destructive tendencies.

Histrionic Personality Disorder
- Exaggerated, overly dramatic expression of emotions and attention-seeking behavior that often includes sexually seductive or provocative behaviors.

Narcissistic Personality Disorder
- Grandiose sense of self-importance; exaggerates abilities and accomplishments; excessive need for admiration; boastful, pretentious.

Anxious, Fearful Cluster

Avoidant Personality Disorder
- Extreme social inhibition due to feelings of inadequacy, and hypersensitivity to criticism, rejection, or disapproval.

Dependent Personality Disorder
- Excessive need to be taken care of, leading to submissive, clinging behavior; fears of separation; and the inability to assume responsibility.

Obsessive-Compulsive Personality Disorder
- Rigid preoccupation with orderliness, personal control, rules, or schedules that interferes with completing tasks; unreasonable perfectionism.

Source: Adapted from DSM-IV-TR (2000).

Paranoid Personality Disorder

Pervasive Distrust and Suspiciousness

Doug doesn't trust anyone. He "knows" that strangers, co-workers, and even his family and friends are trying to hurt him. He is convinced that his employer is trying to steal his ideas and treating him unfairly, that the woman he recently began dating is interested only in using him, and that his family members are trying to take advantage of him or humiliate him. Needless to say, other people soon tire of Doug's unfounded suspicions, hostility, and accusations.

Pervasive mistrust and suspiciousness of others are the defining features of the **paranoid personality disorder.** About 3 percent of the general population displays this disorder, which occurs most frequently in men (Oltmanns & Okada, 2006).

Individuals with paranoid personality disorder are constantly on guard. Why? Because they think that other people are out to exploit, harm, or dupe them. For example, when a waitress miscalculated the total on Doug's check, he became furious, assuming she was trying to rip him off. When a neighbor's trash can got tipped over and trash blew into Doug's yard, he was quite angry, convinced that the neighbor had dumped it there on purpose.

People with this personality disorder often misinterpret the innocent comments or actions of others. For example, playful teasing from a co-worker is seen as a deliberate insult, an attack on their character or reputation (Bernstein & Useda, 2007; DSM-IV-TR, 2000). Inappropriate outbursts of anger can occur when the person feels as though he has been wronged by some kind of slight, insult, or injustice—which happens frequently.

People with paranoid personality disorder are distrustful of people who are close to them, even when there is no evidence to support their suspicious beliefs. Not surprisingly, they are very reluctant to form close attachments or confide in others. Doing so, they believe, leaves them vulnerable because the other person could use that information against them. People with this personality disorder also have a strong tendency to blame others for their own shortcomings. They are often harshly critical of what they perceive as the shortcomings of colleagues, friends, or family members. Though they may superficially present themselves as being objective and unemotional, their underlying hostility is evident in sarcastic comments and put-downs. If another person responds in kind, it only confirms their belief that other people are out to attack them.

Pathological jealousy commonly characterizes the intimate relationships of the person with a paranoid personality disorder. Although his spouse or sexual partner may never have given any indication of unfaithfulness, he still suspects and accuses his mate of harboring feelings of infidelity. When his partner is 10 minutes late, makes casual social conversation with other people, or inadvertently rushes out of the house without her wedding ring, the individual with paranoid personality disorder seizes on this behavior as "evidence" of the intent to be unfaithful. The goal of this pathological jealousy is to dominate and maintain complete control of his partner. In doing so, the person thinks he can keep his partner from betraying him and hurting him emotionally.

Unfortunately, there's not a great deal of research on the causes of paranoid personality disorder. Some researchers have hypothesized that childhood abuse or neglect may play a role. Violence, unnecessary litigation, disruptive behavior, and problems in personal relationships are all commonly associated with paranoid personality disorder (Bernstein & Useda, 2007).

paranoid personality disorder A personality disorder characterized by a pervasive distrust and suspiciousness of the motives of others without sufficient basis.

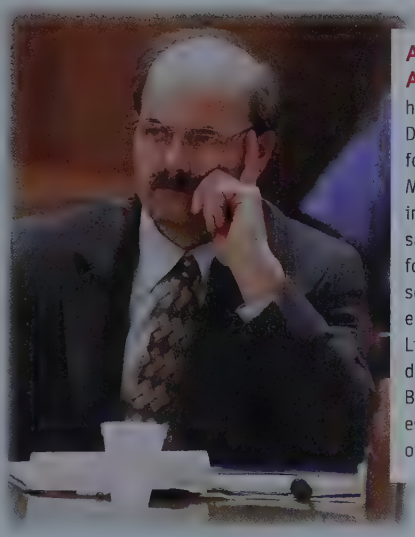
Antisocial Personality Disorder

Violating the Rights of Others—Without Guilt or Remorse

Often referred to as a *psychopath* or *sociopath,* the individual with **antisocial personality disorder** has the ability to lie, cheat, steal, and otherwise manipulate and harm other people. And when caught, the person shows little or no remorse for having caused pain, damage, or loss to others (Patrick, 2007). It's as though the person has

antisocial personality disorder A personality disorder characterized by a pervasive pattern of disregarding and violating the rights of others; such individuals are also often referred to as *psychopaths* or *sociopaths.*

no conscience or sense of guilt. This pattern of blatantly disregarding and violating the rights of others is the central feature of antisocial personality disorder (DSM-IV-TR, 2000). Researchers have also noted a relative lack of anxiety in these individuals, especially those most likely to harm others for their own benefit (De Brito & Hodgins, 2009). Approximately 4 percent of the general population displays the characteristics of antisocial personality disorder, with men far outnumbering women (Grant & others, 2004).



AP Photo/Bo Rader, Pool

An Ordinary Family Man: The Dangers of Antisocial Personality Disorder President of his church council and a very active church member, Dennis Rader had been a Scout leader and worked for the Wichita, Kansas, animal control department. Married for 34 years, Rader had been very involved in the lives of his two children. But Rader was also the sadistic killer who called himself "BTK," which stood for "Bind, torture, kill." In court, Rader shocked even seasoned police officers with his matter-of-fact, emotionless recital of the details of his 10 murders. Like Rader, people with antisocial personality disorder wear a "mask of sanity" (Lynam & Gudonis, 2005). Because they are socially skilled, their crimes often escape detection. Because they lack empathy, they see other people only as objects for their gratification.

Evidence of this maladaptive personality pattern is often seen in childhood or early adolescence (Hiatt & Dishion, 2008; Diamantopoulou & others, 2010). In many cases, the child has repeated run-ins with the law or school authorities. Behaviors that draw the attention of authorities can include cruelty to animals, attacking or harming adults or other children, theft, setting fires, and destroying property. During childhood and adolescence, this pattern of behavior is typically diagnosed as *conduct disorder*. The habitual failure to conform to social norms and rules often becomes the person's predominant life theme, which continues into adulthood (Patrick, 2007).

Deceiving and manipulating others for their own personal gain is another hallmark of individuals with antisocial personality disorder. With an uncanny ability to look you directly in the eye and speak with complete confidence and sincerity, they will lie in order to gain money, sex, or whatever their goal may be. When confronted with their actions, they respond with indifference or offer some superficial rationalization to justify their behavior. Often, they are contemptuous about the feelings or rights of others, blaming the victim for his or her stupidity. This quality makes antisocial personality disorder especially difficult to treat because clients often manipulate and lie to their therapists, too (McMurran & Howard, 2009).

Because they are consistently irresponsible, individuals with antisocial personality disorder often fail to hold a job or meet financial obligations. Losing or quitting one job after another, defaulting on loans, and failing to make child support payments are common occurrences. Their past is often checkered with arrests and jail sentences. High rates of alcoholism and other forms of substance abuse are also strongly associated with antisocial personality disorder (Fridell & others, 2008). However, by middle to late adulthood, the antisocial tendencies of such individuals tend to diminish.

Borderline Personality Disorder

Chaos and Emptiness

> Borderline individuals are the psychological equivalent of third-degree burn patients. They simply have no emotional skin. Even the slightest touch or movement can create immense suffering.

This is how Marsha Linehan (2009) describes the chaotic, unstable world of people with **borderline personality disorder (BPD).** Borderline personality disorder is characterized by impulsiveness and chronically unstable emotions, relationships, and self-image. Moods and emotions are intense, fluctuating, and extreme, often vastly out of proportion to the triggering incident, and seemingly uncontrollable. The person with borderline personality disorder unpredictably swings from one mood extreme to another. Inappropriate, intense, and often uncontrollable episodes of anger are another hallmark of this disorder (Berenson & others, 2011).

borderline personality disorder A personality disorder characterized by instability of interpersonal relationships, self-image, and emotions, and marked impulsivity.



Ben Dome/PacificCoastNews/Newscom

Inflicting Physical Pain to Relieve Emotional Agony

"Cutting"—slicing into your own skin with a razor, knife, or other sharp object—is a common symptom among those diagnosed with borderline personality disorder (Selby & others, 2011). Why would someone intentionally inflict such painful injuries on herself? Singer Amy Winehouse spoke openly about having cut herself since she was 9 years old, and once cut herself with a shard of glass on film while being interviewed by a *Spin* magazine reporter. The physical pain of cutting, Winehouse reportedly said, helped ease her emotional pain. Winehouse died of acute alcohol poisoning at the age of 27.

Relationships with others are as chaotic and unstable as the person's moods. The person with borderline personality disorder has a chronic, pervasive sense of emptiness. Above all, she is desperately afraid of abandonment and alternately clings to others and pushes them away. Because her sense of identity is so fragile, she constantly seeks reassurance and self-definition from others. When it is not forthcoming, she may erupt in furious anger or abject despair.

Relationships careen out of control as the person shifts from inappropriately idealizing the newfound lover or friend to viewing them with complete contempt or hostility. She sees herself, and everyone else, as absolutes: ecstatic or miserable, perfect or worthless (South & others, 2008).

Often, the deep despair and inner emptiness that people with BPD experience are outwardly expressed in self-destructive behavior (Linehan & Dexter-Mazza, 2008). "Cutting" or other acts of self-mutilation, threats of suicide, and suicide attempts are common, especially in response to perceived rejection or abandonment. Underscoring the seriousness of borderline personality disorder is a grim statistic: As many as 10 percent of those who meet the BPD criteria eventually commit suicide—a rate that is *50 times* that of the general population (American Psychiatric Association, 2001; Crowell & others, 2009).

Borderline personality disorder is often considered to be the most serious and disabling of the personality disorders. People with this disorder often also suffer from depression, substance abuse, and eating disorders (Mercer & others, 2009; Walter & others, 2009). And because they often lack control over their impulses, self-destructive, impulsive behavior is common, such as gambling, reckless driving, drug abuse, or sexual promiscuity.

Along with being among the most severe of the personality disorders, borderline personality disorder is also the most commonly diagnosed. A recent survey found that BPD was more prevalent than previously thought. Estimates suggest that BPD affects about 6 percent of the population, or possibly some 18 million Americans (Grant & others, 2008). The researchers also found the highest prevalence of borderline personality disorder among women, people in lower income groups, and Native American men, while the lowest incidence was among women of Asian descent.

What Causes Borderline Personality Disorder?

As with the other personality disorders, multiple factors have been implicated. Because people with borderline personality disorder have such intense and chronic fears of abandonment and are terrified of being alone, some researchers believe that a disruption in attachment relationships in early childhood is an important contributing cause (Barone & others, 2011). Dysfunctional family relationships are common: Many borderline patients report having experienced neglect or physical, sexual, or emotional abuse in childhood (Ball & Links, 2009; Watson & others, 2006).

A more comprehensive theory, called the *biosocial developmental theory of borderline personality disorder,* has been proposed by psychologist Marsha Linehan (1993; Crowell & others, 2009). According to this view, borderline personality disorder is the outcome of a unique combination of biological, psychological, and environmental factors. Some children are born with a biological temperament that is characterized by extreme emotional sensitivity, a tendency to be impulsive, and the tendency to experience negative emotions. Linehan believes that borderline personality disorder results when such a biologically vulnerable child is raised by caregivers who do not teach him how to control his impulses or help him learn how to understand, regulate, and appropriately express his emotions (Crowell & others, 2009).

In some cases, Linehan believes, parents or caregivers actually shape and reinforce the child's pattern of frequent, intense emotional displays by their own behavior. For example, they may sometimes ignore a child's emotional outbursts and sometimes reinforce them. In Linehan's theory, a history of abuse and neglect may be present but is not a necessary ingredient in the toxic mix that produces borderline personality disorder.

The Dissociative Disorders

Fragmentation of the Self

KEY THEME

› In the dissociative disorders, disruptions in awareness, memory, and identity interfere with the ability to function in everyday life.

KEY QUESTIONS

› What is dissociation, and how do normal dissociative experiences differ from the symptoms of dissociative disorders?

› What are dissociative amnesia, dissociative fugue, and dissociative identity disorder (DID)?

› What is thought to cause DID?

dissociative experience A break or disruption in consciousness during which awareness, memory, and personal identity become separated or divided.

dissociative disorders A category of psychological disorders in which extreme and frequent disruptions of awareness, memory, and personal identity impair the ability to function.

dissociative amnesia A dissociative disorder involving the partial or total inability to recall important personal information.

Despite the many changes you've experienced throughout your lifetime, you have a pretty consistent sense of identity. You're aware of your surroundings and can easily recall memories from the recent and distant past. In other words, a normal personality is one in which *awareness, memory,* and *personal identity* are associated and well-integrated.

In contrast, a **dissociative experience** is one in which a person's awareness, memory, and personal identity become separated or divided. While that may sound weird, dissociative experiences are not inherently pathological. Mild dissociative experiences are quite common and completely normal (Dalenberg & others, 2009; Wieland, 2011). For example, you become so absorbed in a book or movie that you lose all track of time. Or you're so preoccupied with your thoughts while driving that when you arrive at your destination, you remember next to nothing about the trip. In each of these cases, you've experienced a temporary "break" or "separation" in your memory or awareness—a temporary, mild dissociative experience.

Clearly, then, dissociative experiences are not necessarily abnormal. But in the **dissociative disorders,** the dissociative experiences are much more extreme or more frequent and severely disrupt everyday functioning. Awareness, or recognition of familiar surroundings, may be completely obstructed. Memories of pertinent personal information may be unavailable to consciousness. Identity may be lost, confused, or fragmented (Dell & O'Neil, 2009).

The category of dissociative disorders consists of three basic disorders: *dissociative amnesia, dissociative fugue,* and *dissociative identity disorder,* which was previously called *multiple personality disorder.* Until recently, the dissociative disorders were thought to be extremely rare. How rare? An extensive review conducted in the 1940s uncovered a grand total of 76 reported cases of dissociative disorders since the beginnings of modern medicine in the 1700s (Taylor & Martin, 1944). Although a few more cases were reported during the 1950s and 1960s, the clinical picture changed dramatically in the 1970s when a surge of dissociative disorder diagnoses occurred (Kihlstrom, 2005). Later in this discussion, we'll explore some of the possible reasons as well as the controversy surrounding the "epidemic" of dissociative disorders that began in the 1970s.

Dissociation and Possession A member of the Dongria Kondh tribe in eastern India dances in a trance during a ceremony on top of Niyamgiri mountain, which the community regards as sacred. Such dissociative trance and possession states are common in religions around the world (Krippner, 1994). When dissociative experiences take place within a religious ritual context, they are not considered abnormal. In fact, such experiences may be highly valued (Mulhern, 1991).



REUTERS/Reinhard Krause

Dissociative Amnesia and Fugue

Forgetting and Wandering

Dissociative amnesia refers to the partial or total inability to recall important information that is not due to a medical condition, such as an illness, an injury, or a drug. Usually the person develops amnesia for personal events and information, rather than for general knowledge or skills. That is, the person may not be able to remember his wife's name but does remember how to read and who Martin Luther King, Jr., was. In most cases, dissociative amnesia is a response to stress, trauma, or an extremely distressing situation, such as combat, marital problems, or physical abuse (McLewin & Muller, 2006).



Nicole Bengiveno/The New York Times

Dissociative Fugue: When Identity Goes "Off Line" Just before a new school year, 23-year-old teacher Hannah Upp disappeared. Intensive search efforts produced nothing, but then Hannah was seen at a Manhattan Apple store and, later, at a Starbucks. Hannah was finally rescued when a Staten Island Ferry crew saw her swimming almost a mile from shore. Hannah had no memories of the events following her disappearance. Although psychologists don't understand what causes dissociative fugue, a rare condition, stressful events are often implicated. "It's as if a whole set of information about one's self, our autobiography, goes off line," says expert Richard Loewenstein. Fortunately, dissociative fugue episodes usually do not recur.

A closely related disorder is dissociative fugue. In **dissociative fugue,** the person outwardly appears completely normal. However, the person has extensive amnesia and is confused about his identity. While in the fugue state, he suddenly and inexplicably travels away from his home, wandering to other cities or even countries. In some cases, people in a fugue state adopt a completely new identity.

Like dissociative amnesia, dissociative fugues are thought to be associated with traumatic events or stressful periods (van der Hart & others, 2006). However, it's unclear as to *how* a fugue state develops, or *why* a person experiences a fugue state rather than other sorts of symptoms, such as simple anxiety or depression. Interestingly, when the person "awakens" from the fugue state, he may remember his past history but have amnesia for what occurred *during* the fugue state (DSM-IV-TR, 2000).

Dissociative Identity Disorder

Multiple Personalities

Among the dissociative disorders, none is more fascinating—or controversial—than dissociative identity disorder, formerly known as *multiple personality disorder.* **Dissociative identity disorder (DID)** involves extensive memory disruptions for personal information along with the presence of two or more distinct identities, or "personalities," within a single person.

Typically, each personality has its own name and is experienced as if it has its own personal history and self-image. These alternate personalities, often called *alters* or *alter egos,* may be of widely varying ages and different genders. Alters are not really separate people. Rather, they constitute a "system of mind" (Courtois & Ford, 2009). That is, the alters seem to embody different aspects of the individual's personality that, for some reason, cannot be integrated into the primary personality. The alternate personalities hold memories, emotions, and motives that are not admissible to the individual's conscious mind. At different times, different alter egos take control of the person's experience, thoughts, and behavior. Typically, the primary personality is unaware of the existence of the alternate personalities. However, the alter egos may have knowledge of each other's existence and share memories (see Kong & others, 2008). Sometimes the experiences of one alter are accessible to another alter but not vice versa.

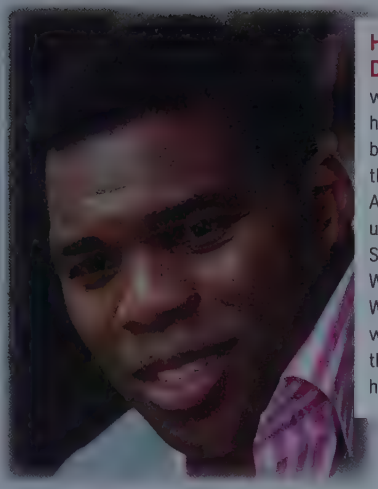
Symptoms of amnesia and memory problems are reported in virtually all cases of DID. There are frequent gaps in memory for both recent and childhood experiences. Commonly, those with dissociative identity disorder "lose time" and are unable to recall their behavior or whereabouts during specific time periods. In addition to their memory problems, people with DID typically have numerous psychiatric and physical symptoms, along with a chaotic personal history (Cardena & Gleaves, 2007). Symptoms of major depression, anxiety, post-traumatic stress disorder, substance abuse, sleep disorders, and self-destructive behavior are also very common. Often, the DID patient has been diagnosed with a variety of other psychological disorders before the DID diagnosis is made (Gleaves & others, 2003; Rodewald & others, 2011).



John Caldwell

"Tell me more about these nine separate and distinct personalities."

Not all mental health professionals are convinced that dissociative identity disorder is a genuine psychological disorder (Cardena & Gleaves, 2007; Lynn & others, 2006). One reason for skepticism is that reported cases sharply increased in the early 1970s shortly after books, films, and television dramas about multiple personality disorder became popular. As psychologist John Kihlstrom (2005) noted, not only the number of cases but also the number of "alters" showed a dramatic increase. To some psychologists, such findings suggest that DID patients learned "how to behave like a multiple" from media portrayals of sensational cases or by responding to their therapists' suggestions (Gee & others, 2003).



AP Photo/John Amis

Herschel Walker and Dissociative Identity Disorder As a professional football player, Walker (2008) was somewhat of an enigma to his teammates because of his diverse pursuits, which ranged from bob-sledding to ballet dancing, and because he often referred to himself in the third person. "Herschel played well today," he might say. After retiring from football, Walker began suffering from unexplained violent outbursts, black-outs, and memory loss. Since being diagnosed with dissociative identity disorder, Walker has identified a dozen distinct alters, including "The Warrior" who handled playing football and the pain that went with it, and "The Hero" who made public appearances. With therapy, Walker is learning to manage his symptoms and hopes to educate the public about this rare disorder.

On the other hand, DID is not the only psychological disorder for which prevalence rates have increased over time. For example, rates of obsessive–compulsive disorder and PTSD have also increased over the past few decades, primarily because mental health professionals have become more aware of these disorders and more likely to screen for symptoms (Gleaves, 1996). The dissociative disorders are summarized in Table 14.8.

Explaining Dissociative Identity Disorder

According to one explanation, dissociative identity disorder represents an extreme form of dissociative coping (Moskowitz & others, 2009). A very high percentage of DID patients report having suffered extreme physical or sexual abuse in childhood—over 90 percent in most surveys (Foote & others, 2006; Sar & others, 2007). According to this explanation, to cope with the trauma, the child "dissociates" himself or herself from it, creating alternate personalities to experience the trauma.

Over time, alternate personalities are created to deal with the memories and emotions associated with intolerably painful experiences. Feelings of anger, rage, fear, and guilt that are too powerful for the child to consciously integrate can be dissociated into these alternate personalities. In effect, dissociation becomes a pathological defense mechanism that the person uses to cope with overwhelming experiences.

TABLE 14.8

Dissociative Disorders

Dissociative Amnesia

- Inability to remember important personal information, too extensive to be explained by ordinary forgetfulness

Dissociative Fugue

- Sudden, unexpected travel away from home
- Amnesia
- Confusion about personal identity or assumption of new identity

Dissociative Identity Disorder

- Presence of two or more distinct identities, each with consistent patterns of personality traits and behavior
- Behavior that is controlled by two or more distinct, recurring identities
- Amnesia; frequent memory gaps

dissociative fugue (fyoog) A dissociative disorder involving sudden and unexpected travel away from home, extensive amnesia, and identity confusion.

dissociative identity disorder (DID) A dissociative disorder involving extensive memory disruptions along with the presence of two or more distinct identities, or "personalities"; formerly called *multiple personality disorder.*

schizophrenia A psychological disorder in which the ability to function is impaired by severely distorted beliefs, perceptions, and thought processes.

positive symptoms In schizophrenia, symptoms that reflect excesses or distortions of normal functioning, including delusions, hallucinations, and disorganized thoughts and behavior.

negative symptoms In schizophrenia, symptoms that reflect defects or deficits in normal functioning, including flat affect, alogia, and avolition.

delusion A falsely held belief that persists despite compelling contradictory evidence.

hallucination A false or distorted perception that seems vividly real to the person experiencing it.

Although widely accepted among therapists who work with dissociative identity disorder patients, the dissociative coping theory is difficult to test empirically. One problem is that memories of childhood are notoriously unreliable. Since DID is usually diagnosed in adulthood, it is very difficult, and often impossible, to determine whether the reports of childhood abuse are real or imaginary.

Another problem with the "traumatic memory" explanation of dissociative identity disorder is that just the *opposite* effect occurs to most trauma victims—they are bothered by recurring and intrusive memories of the traumatic event. For example, in a study by Gail Goodman and her colleagues (2003), more than 80 percent of young adults with a documented history of childhood sexual abuse remembered the abuse. Of those who didn't report the abuse, reluctance to disclose the abuse and being too young to remember the abuse seemed to be the most likely explanations. Although the scientific debate about the validity of the dissociative disorders is likely to continue for some time, the dissociative disorders are fundamentally different from the last major category of disorders we'll consider—schizophrenia.

Schizophrenia

A Different Reality

KEY THEME

› One of the most serious psychological disorders is schizophrenia, which involves severely distorted beliefs, perceptions, and thought processes.

KEY QUESTIONS

› What are the major symptoms of schizophrenia, and how do positive and negative symptoms differ?

› What are the main subtypes of schizophrenia?

› What factors have been implicated in the development of schizophrenia?

Normally, you've got a pretty good grip on reality. You can easily distinguish between external reality and the different kinds of mental states that you routinely experience, such as dreams or daydreams. But as we negotiate life's many twists and turns, the ability to stay firmly anchored in reality is not a given. Rather, we're engaged in an ongoing process of verifying the accuracy of our thoughts, beliefs, and perceptions.

If any mental disorder demonstrates the potential for losing touch with reality, it's schizophrenia. **Schizophrenia** is a psychological disorder that involves severely distorted beliefs, perceptions, and thought processes. During a schizophrenic episode, people lose their grip on reality, like the woman screaming "Fire!" in the chapter Prologue. They become engulfed in an entirely different inner world, one that is often characterized by mental chaos, disorientation, and frustration.

Glimpses of Schizophrenia Artist Karen Sorenson, who manages her schizophrenia with medication, painted "Electricity Makes You Float" shortly after the 9/11 World Trade Center attacks. The painting, she says, grew out of a "psychotic fantasy . . . I thought that I could shoot rays of energy from the palms of my hands and blow up buildings. Somehow I identified with murderers. Making this picture helped free me of the obsessiveness of the idea . . . [by] putting it out there into the brilliance of daylight."



Courtesy of Karen Sorensen

Symptoms of Schizophrenia

The characteristic symptoms of schizophrenia can be described in terms of two broad categories: positive and negative symptoms. **Positive symptoms** reflect an excess or distortion of normal functioning. Positive symptoms include (1) *delusions,* or false beliefs; (2) *hallucinations,* or false perceptions; and (3) severely disorganized thought processes, speech, and behavior. In contrast, **negative symptoms** reflect an absence or reduction of normal functions, such as greatly reduced motivation, emotional expressiveness, or speech.

According to DSM-IV-TR, schizophrenia is diagnosed when two or more of these characteristic symptoms are actively present for a month or longer. Usually, schizophrenia also involves a longer personal history, typically six months or more, of odd behaviors, beliefs, perceptual experiences, and other less severe signs of mental disturbance (Keshavan & others, 2011; Torrey, 2006).

Positive Symptoms

Delusions, Hallucinations, and Disturbances in Sensation, Thinking, and Speech

A **delusion** is a false belief that persists despite compelling contradictory evidence. Schizophrenic delusions are not simply unconventional or inaccurate beliefs. Rather, they are bizarre and far-fetched notions. The person may believe that secret agents are poisoning his food or that the next-door neighbors are actually aliens from outer space who are trying to transform him into a remote-controlled robot. The delusional person often becomes preoccupied with his erroneous beliefs and ignores any evidence that contradicts them.

Certain themes consistently appear in schizophrenic delusions (Woo & Keatinge, 2008). *Delusions of reference* reflect the person's false conviction that other people's behavior and ordinary events are somehow personally related to her. For example, she is certain that billboards and advertisements are about her or contain cryptic messages directed at her. In contrast, *delusions of grandeur* involve the belief that the person is extremely powerful, important, or wealthy. In *delusions of persecution,* the basic theme is that others are plotting against or trying to harm the person or someone close to her. *Delusions of being controlled* involve the belief that outside forces—aliens, the government, or random people, for example—are trying to exert control on the individual.

Schizophrenic delusions are often so convincing that they can provoke inappropriate or bizarre behavior. Delusional thinking may lead to dangerous behaviors, as when a person responds to his delusional ideas by hurting himself or attacking others.

Among the most disturbing experiences in schizophrenia are **hallucinations,** which are false or distorted perceptions—usually voices or visual stimuli—that seem vividly real (see Figure 14.4). The content of hallucinations is often tied to the person's delusional beliefs. For example, if she harbors delusions of grandeur, hallucinated voices may reinforce her grandiose ideas by communicating instructions from God, the devil, or angels. If the person harbors delusions of persecution, hallucinated voices or images may be extremely frightening, threatening, or accusing. The content of hallucinations and delusions may also be influenced by culture and religious beliefs.

When a schizophrenic episode is severe, hallucinations can be virtually impossible to distinguish from objective reality. For example, the young woman in the Prologue probably did see vivid but hallucinated images of fire. When schizophrenic symptoms are less severe, the person may recognize that the hallucination is a product of his own mind. As one young man confided to your author Don, "I know the voices aren't real, but I can't make them stop talking to me." As this young man got better, the hallucinated voices did eventually stop.

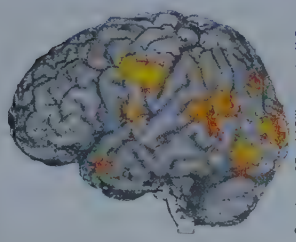
Other positive symptoms of schizophrenia include disturbances in sensation, thinking, and speech. Visual, auditory, and tactile experiences may seem distorted or unreal. For example, one woman described the sensory distortions in this way:

> Looking around the room, I found that things had lost their emotional meaning. They were larger than life, tense, and suspenseful. They were flat, and colored as if in artificial light. I felt my body to be first giant, then minuscule. My arms seemed to be several inches longer than before and did not feel as though they belonged to me. (Anonymous, 1990)

Along with sensory distortions, the person may experience severely disorganized thinking. It becomes enormously difficult to concentrate, remember, and integrate important information while ignoring irrelevant information (Barch, 2005). The person's mind drifts from topic to topic in an unpredictable, illogical manner. Such disorganized thinking is often reflected in the person's speech (Badcock & others, 2011). Ideas, words, and images are sometimes strung together in ways that seem nonsensical to the listener.

FOCUS ON NEUROSCIENCE

The Hallucinating Brain



Courtesy of David Silbersweig, M.D., Emily Stern, M.D., Cornell Medical Center

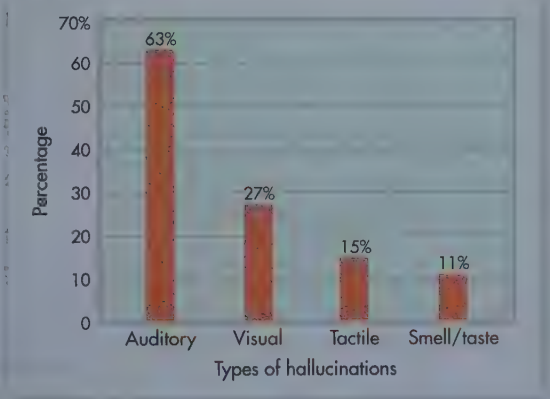
Researcher David Silbersweig and his colleagues (1995) used PET scans to take a "snapshot" of brain activity during schizophrenic hallucinations. The scan shown here was recorded at the exact instant a schizophrenic patient hallucinated disembodied heads yelling orders at him. The bright orange areas reveal activity in the left auditory and visual areas of his brain, but not in the frontal lobe, which normally is involved in organized thought processes.

People with schizophrenia might hear the roars of Satan or the whispers of children. They might move armies with their thoughts and receive instructions from other worlds. They might feel penetrated by scheming parasites, stalked by enemies, or praised by guardian angels. People with schizophrenia might also speak nonsensically, their language at once intricate and impenetrable. And many would push, or be pushed, to the edge of the social landscape, overcome by solitude.

—R. Walter Heinrichs, 2005

FIGURE 14.4 Incidence of Different Types of Hallucinations in Schizophrenia
Schizophrenia-related hallucinations can occur in any sensory modality. Auditory hallucinations, usually in the form of voices, are the most common type of hallucinations that occur in schizophrenia, followed by visual hallucinations.

Source: Adapted from data in Mueser & others (1990) and Bracha & others (1989).



CULTURE AND HUMAN BEHAVIOR

Travel Advisory: The Jerusalem Syndrome

Whether it occurs in Baltimore or Beijing, Minneapolis or Moscow, schizophrenia is usually characterized by delusions and hallucinations. However, the *content* of the person's delusions and hallucinations is often influenced by cultural factors, including that culture's dominant religious beliefs. Consider one interesting example: the *Jerusalem syndrome*, which has been described by psychiatrist Yair Bar-El and his colleagues (2000) at Kfar Shaul Mental Health Center in Israel.

Christians, Jews, and Muslims regard the city of Jerusalem as a richly historical and holy city. Annually, about 2 million tourists from around the world visit the city. But for about 100 visitors every year, arriving in the famous holy city triggers a psychotic break that involves religious delusions and hallucinations—the essence of the *Jerusalem syndrome.* About half of these people require psychiatric hospitalization (Fastovsky & others, 2000). The disorder occurs frequently enough that Jerusalem tour guides and hotel personnel are familiar with it and will notify authorities when they spot someone displaying the symptoms.

Identifying with biblical characters is a common feature of the Jerusalem syndrome. As a general rule, Christians tend to believe that they are Jesus Christ, the Virgin Mary, or John the Baptist. In contrast, Jews tend to gravitate toward a Hebrew hero like Moses, Samson, or King David. And Muslims simply tend to say that they're the *Mahdi* (Messiah).

Usually, the person has a history of serious mental disorders, such as previous episodes of schizophrenia or bipolar disorder. But in about 10 percent of Jerusalem syndrome cases, the person has *no* history of mental disorders. Instead, the person spontaneously experiences a psychotic episode while in Jerusalem.

For example, a Swiss lawyer was on a three-week group tour of Greece, Israel, and Egypt. Everything was fine until the tour visited Jerusalem. On the first night in Jerusalem, the man became nervous and agitated, withdrew from the group, and became obsessed with becoming clean and pure, taking many showers. Then, using the white hotel linen to make a biblical-style, toga-like gown, he marched to one of Jerusalem's holy sites and delivered a rambling "sermon" about how humanity should adopt a more moral and simple way of life. Fortunately, within a matter of days, the syndrome passed and the man's symptoms abated.

What causes the Jerusalem syndrome? One possible explanation is that the disruptions of travel temporarily influence a person's mental state. According to Bar-El and his colleagues (2000), factors such as time-zone changes, unfamiliar surroundings, and exposure to strangers and foreigners probably contribute to the transient psychological instability. In a vulnerable person, encountering cultural differences in behavior combined with being on a spiritual pilgrimage to one of the world's great holy cities can trigger an acute psychotic episode.



A Ramey/Photo Edit

A Pilgrimage Gone Awry Being in the presence of a historic religious site like the Wailing Wall in Jerusalem is an overwhelming emotional experience for many tourists. In some vulnerable people, such experiences trigger a temporary episode of psychological instability and religious delusions.

Negative Symptoms

Flat Affect, Alogia, and Avolition

Negative symptoms consist of marked deficits or decreases in behavioral or emotional functioning. One commonly seen negative symptom is referred to as *flat affect,* or *affective flattening.* Regardless of the situation, the person responds in an emotionally "flat" way, showing a dramatic reduction in emotional responsiveness and facial expressions. Speech is slow and monotonous, lacking normal vocal inflections. A closely related negative symptom is *alogia,* or greatly reduced production of speech. In alogia, verbal responses are limited to brief, empty comments.

Finally, *avolition* refers to the inability to initiate or persist in even simple forms of goal-directed behaviors, such as dressing, bathing, or engaging in social activities. Instead, the person seems to be completely apathetic, sometimes sitting still for hours at a time. In combination, the negative symptoms accentuate the isolation of the person with schizophrenia, who may appear uncommunicative and completely disconnected from his or her environment.

Types of Schizophrenia

Figure 14.5 shows the frequency of positive and negative symptoms at the time of hospitalization for schizophrenia. These symptoms are used in diagnosing the particular subtype of schizophrenia. DSM-IV-TR includes three basic subtypes of schizophrenia: *paranoid, catatonic,* and *disorganized* (see Table 14.9).

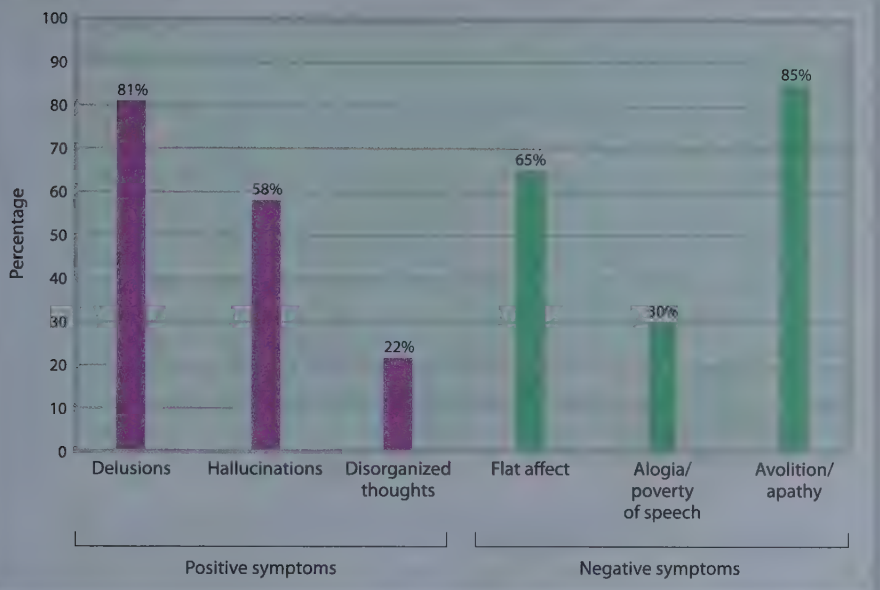


FIGURE 14.5 Presence of Symptoms in Schizophrenia This graph shows the incidence of positive and negative symptoms in over 100 people at the time they were hospitalized for schizophrenia. Delusions were the most common positive symptom, and avolition, or apathy, was the most common negative symptom.

Source: Based on data reported in Andreasen & Flaum (1991).

The *paranoid type* of schizophrenia is characterized by the presence of delusions, hallucinations, or both. However, people with paranoid schizophrenia show virtually no cognitive impairment, disorganized behavior, or negative symptoms. Instead, well-organized delusions of persecution or grandeur are operating. Auditory hallucinations in the form of voices talking about the delusional ideas are also often evident. Convinced that others are plotting against them, these people react with extreme distrust of others. Or they may assume an air of superiority, confident in the delusional belief that they have "special powers." The paranoid type is the most common type of schizophrenia.

The *catatonic type* of schizophrenia is marked by highly disturbed movements or actions. These may include bizarre postures or grimaces, extremely agitated behavior, complete immobility, the echoing of words just spoken by another person, or imitation of the movements of others. People with this form of schizophrenia will resist direction from others and may also assume rigid postures to resist being moved. Catatonic schizophrenia is often characterized by another unusual symptom, called *waxy flexibility*. Like a wax figure, the person can be "molded" into any position and will hold that position indefinitely. The catatonic type of schizophrenia is very rare.

The prominent features of the *disorganized type* of schizophrenia are extremely disorganized behavior, disorganized speech, and flat affect. Delusions and hallucinations are sometimes present, but they are not well-organized and integrated, like those that characterize paranoid schizophrenia. Instead, people with the disorganized type experience delusions and hallucinations that contain fragmented, shifting themes. Silliness, laughing, and giggling may occur for no apparent reason. In short, the person's behavior is very peculiar. This type of schizophrenia was formerly called *hebephrenic schizophrenia*, and that term is still sometimes used.

Finally, the label *undifferentiated type* is used when an individual displays some combination of positive and negative symptoms that does not clearly fit the criteria for the paranoid, catatonic, or disorganized types.

TABLE 14.8

Types of Schizophrenia

Paranoid Type
- Well-organized delusional beliefs reflecting persecutory or grandiose ideas
- Frequent auditory hallucinations, usually voices
- Little or no disorganized behavior, speech, or flat affect

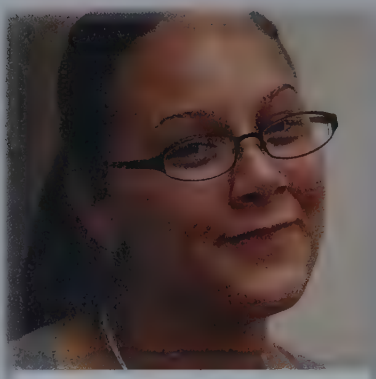
Catatonic Type
- Highly disturbed movements or actions, such as extreme excitement, bizarre postures or grimaces, or being completely immobile
- Echoing of words spoken by others or imitation of movements of others

Disorganized Type
- Flat or inappropriate emotional expressions
- Severely disorganized speech and behavior
- Fragmented delusional ideas and hallucinations

Undifferentiated Type
- Display of characteristic symptoms of schizophrenia but not in a way that fits the pattern for paranoid, catatonic, or disorganized type

The Prevalence and Course of Schizophrenia

Every year, about 200,000 new cases of schizophrenia are diagnosed in the United States, and annually, approximately 1 million Americans are treated for schizophrenia. All told, about 1 percent of the U.S. population will experience at least one episode



AP Photo/The Daily Press, Dave Bowman

Young Adulthood and Schizophrenia The onset of schizophrenia typically occurs between the ages of 18 and 25. Amber Main fit that pattern when she started hearing voices during her freshman year of college. She also started believing that hidden cameras were tracking her. Usually an excellent student, her grades plummeted because she couldn't concentrate. In January she was hospitalized. Fortunately, Amber responded well to an antipsychotic medication and was able to return to school. Amber has chosen to openly discuss her illness, even appearing in an MTV documentary. As she explains, "I don't want to hide what I am, or what's a part of me. But I'm not my mental illness, it's just something I have to deal with."

of schizophrenia at some point in life (Rado & Janicak, 2009). Worldwide, no society or culture is immune to this mental disorder. Most cultures correspond very closely to the 1 percent rate of schizophrenia seen in the United States (Minzenberg & others, 2011).

The onset of schizophrenia typically occurs during young adulthood (Gogtay & others, 2011; Tarrier, 2008). However, the course of schizophrenia is marked by enormous individual variability. Even so, a few global generalizations are possible (Malla & Payne, 2005; Walker & others, 2004). The good news is that about one-quarter of those who experience an episode of schizophrenia recover completely and never experience another episode. Another one-quarter experience recurrent episodes of schizophrenia but often with only minimal impairment in the ability to function.

Now the bad news. For the rest of those who have experienced an episode of schizophrenia—about one-half of the total—schizophrenia becomes a chronic mental illness, and the ability to function may be severely impaired. The people in this last category face the prospect of repeated hospitalizations and extended treatment. Thus, chronic schizophrenia places a heavy emotional, financial, and psychological burden on people with the disorder, their families, and society (Combs & Mueser, 2007).

Explaining Schizophrenia

Schizophrenia is an extremely complex disorder. There is enormous individual variability in the onset, symptoms, duration, and recovery from schizophrenia. So it shouldn't come as a surprise that the causes of schizophrenia seem to be equally complex. In this section, we'll survey some of the factors that have been implicated in the development of schizophrenia.

Genetic Factors

Family, Twin, Adoption, and Gene Studies

Studies of families, twins, and adopted individuals have firmly established that genetic factors play a significant role in many cases of schizophrenia (Pogue-Geile & Yokley, 2010). First, family studies have consistently shown that schizophrenia tends to cluster in certain families (Choi & others, 2007; Torrey, 2006). Second, family and twin studies have consistently shown that the more closely related a person is to someone who has schizophrenia, the greater the risk that she will be diagnosed with schizophrenia at some point in her lifetime (see Figure 14.6). Third, adoption studies have consistently shown that if either *biological* parent of an adopted individual had schizophrenia, the adopted individual is at greater risk to develop schizophrenia (Wynne & others, 2006). And fourth, by studying families that display a high rate of schizophrenia, researchers have consistently found that the presence of certain genetic variations seems to increase susceptibility to the disorder (Fanous & others, 2005; Williams & others, 2005).

Ironically, some of the best evidence that points to genetic involvement in schizophrenia—the almost 50 percent risk rate for a person whose identical twin has schizophrenia—is the same evidence that underscores the importance of environmental factors (Joseph & Leo, 2006; Oh & Petronis, 2008). If schizophrenia were purely a matter of inherited maladaptive genes, then you would expect a risk rate much closer to 100 percent for monozygotic twins. Obviously, nongenetic factors must play a role in explaining why half of identical twins with a schizophrenic twin do *not* develop schizophrenia.

Nevertheless, scientists are getting closer to identifying some of the specific genetic patterns that are associated with an increased risk of developing schizophrenia. New research using sophisticated gene analysis techniques confirms the incredibly complex role that genes play in the development of schizophrenia. For example, a recent study of people with schizophrenia with *no* family history of the disease found that genetic mutations were much higher in the schizophrenic patients than in individuals without schizophrenia (Girard, 2011). These mutations were present in many different genes, including genes that had not previously been associated with schizophrenia.

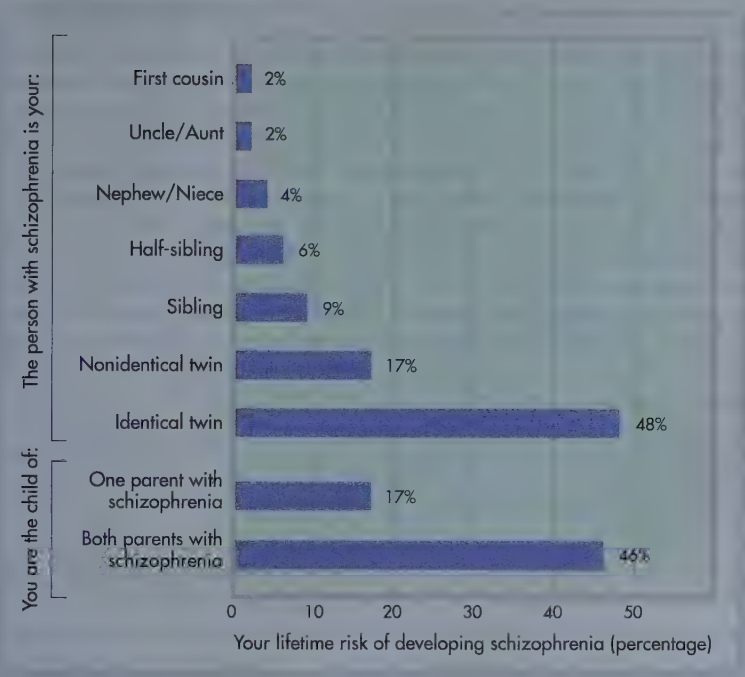


FIGURE 14.6 The Risk of Developing Schizophrenia Among Blood Relatives
The risk percentages shown here reflect the collective results of about 40 studies investigating the likelihood of developing schizophrenia among blood relatives. As you can see, the greatest risk occurs if you have an identical twin who has schizophrenia (48 percent lifetime risk) or if both of your biological parents have schizophrenia (46 percent lifetime risk). However, environmental factors, as well as genetic ones, are involved in the development of schizophrenia.

Source: Gottesman (1991), p. 96.

In another large-scale research project, three different research teams compared DNA samples from thousands of people diagnosed with schizophrenia with DNA samples from control groups of people who did *not* have schizophrenia (Shi & others, 2009; Stefansson & others, 2009; Purcell & others, 2009). Some of the people in the control groups had *other* mental or physical disorders, but most were healthy. The researchers were looking for specific genetic variations that were more common in the genomes of people with schizophrenia than in people without schizophrenia.

Collectively, the studies found that schizophrenia was associated with literally *thousands* of common gene variations. Some of the specific variants were quite rare, while others were quite common. Taken individually, none of the gene variants is capable of "causing" schizophrenia. Even in combination, the genetic variants are only associated with an increased *risk* of developing schizophrenia.

As yet, no specific pattern of genetic variation can be identified as the genetic "cause" of schizophrenia. However, three particularly interesting findings stand out. First, some of the same unique genetic patterns associated with schizophrenia have also been found in DNA samples from people with bipolar disorder (Purcell & others, 2009). This finding suggests that bipolar disorder and schizophrenia might share some common genetic origins. Second, also implicated were several chromosome locations that are associated with genes that influence brain development, memory, and cognition. Finally, a large number of the gene variants were found to occur on a specific chromosome that is also known to harbor genes involved in the immune response (Shi & others, 2009). Later in this section, we'll discuss some intriguing links between viral infections and schizophrenia, which suggests that the immune system may be implicated in the development of schizophrenia.

Paternal Age

Older Fathers and the Risk of Schizophrenia

Despite the fact that family and twin studies point to the role of genetic factors in the risk of developing schizophrenia, no genetic model thus far explains all of the patterns of schizophrenia occurrence within families (Insel & Lehner, 2007). Adding to the complexity, schizophrenia often occurs in individuals with *no* family history of mental disorders.

One explanation for these anomalies is that for each generation, new cases of schizophrenia arise from genetic mutations carried in the sperm of the biological fathers, especially older fathers. As men age, their sperm cells continue to reproduce by dividing. By the time a male is 20, his sperm cells have undergone about 200 divisions; by the time he is 40, about 660 divisions. As the number of divisions increases over time, the sperm cells accumulate genetic mutations that can then be passed on to that man's offspring. Hence, the theory goes, as paternal age increases, the risk of offspring developing schizophrenia also increases (Bajwa & others, 2011).

Researcher Dolores Malaspina and her colleagues (2001) explored this notion by reviewing data on more than 87,000 people born in Jerusalem from 1964 to 1976. Of this group, 658 people had been diagnosed with schizophrenia by 1998. After controlling for various risk factors, the researchers found that paternal age was a strong and significant predictor of the schizophrenia diagnoses. Specifically, Malaspina and her colleagues (2001) found that:

- Men in the 45-to-49 age group who fathered children were twice as likely to have offspring with schizophrenia as compared to fathers age 25 and under.
- Men in the 50-plus age range were three times more likely to produce offspring with schizophrenia.
- More than one-quarter of the schizophrenia cases could be attributed to the father's age.
- The mother's age appeared to play *no* role in the development of schizophrenia.

Clearly, then, paternal age is a potential risk factor. However, it's important to keep in mind that three-quarters of the cases of schizophrenia in this study were *not* associated with older paternal age.

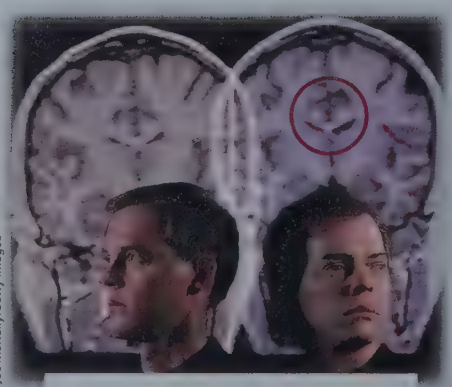
The Immune System

The Viral Infection Theory

Another provocative theory is that schizophrenia might be caused by exposure to an influenza virus or other viral infection during prenatal development or shortly after birth. A virus might seem an unlikely cause of a serious mental disorder, but viruses *can* spread to the brain and spinal cord by traveling along nerves. According to this theory, exposure to a viral infection during prenatal development or early infancy affects the developing brain, producing changes that make the individual more vulnerable to schizophrenia later in life.

There is growing evidence to support the viral infection theory. In one compelling study, psychiatrist Alan S. Brown and his colleagues (2004) compared stored blood samples of 64 mothers of people who later developed schizophrenia with a matched set of blood samples from women whose children did not develop schizophrenia. Both sets of blood samples had been collected years earlier during the women's pregnancies. After analyzing the blood samples for the presence of influenza antibodies, Brown and his colleagues (2004) found that women who had been exposed to the flu virus during the first trimester had a sevenfold increased risk of bearing a child who later developed schizophrenia.

Previous studies using maternal recall and the dates of influenza epidemics have demonstrated similar findings: Children whose mothers were exposed to a flu virus during pregnancy, especially during the first or second trimester, show an increased rate of schizophrenia (Carter, 2008; Yudofsky, 2009). A related finding is that schizophrenia occurs more often in people who were born in the winter and spring months, when upper respiratory infections are most common (Torrey, 2006).



Joe McNally/Getty Images

Identical Twins but Not Identical Brains David and Steven Elmore are identical twins, but they differ in one important respect—Steven *(right)* has schizophrenia. Behind each is a CAT scan, which reveals that Steven's brain is slightly smaller, with less area devoted to the cortex at the top of the brain. Steven also has larger fluid-filled ventricles, which are circled in red on his brain scan. As researcher Daniel Weinberger (1995) commented, "The part of the cortex that Steven is missing serves as perhaps the most evolved part of the human brain. It performs complicated tasks such as thinking organized thoughts. This might help explain why paranoid delusions and hallucinations are characteristic of schizophrenia."

Abnormal Brain Structures

Loss of Gray Matter

Researchers have found that about half of the people with schizophrenia show some type of brain structure abnormality. The most consistent finding has been the enlargement of the fluid-filled cavities, called *ventricles,* located deep within the brain

(Kempton & others, 2010; Meduri & others, 2010). However, researchers are not certain how enlarged ventricles might be related to schizophrenia. Other differences that have been found are a loss of gray matter tissue and lower overall volume of the brain (Cahn & others, 2009; Olabi & others, 2011). As we discussed in Chapter 2, *gray matter* refers to the glial cells, neuron cell bodies, and unmyelinated axons that make up the quarter-inch-thick cerebral cortex.

To investigate the neurological development of schizophrenia, neuroscientist Paul M. Thompson and his colleagues (2001) undertook a prospective study of brain structure changes in 12 adolescents with early-onset childhood schizophrenia. The six females and six males had all experienced schizophrenic symptoms, including psychotic symptoms, before the age of 12. The intent of the study was to provide a visual picture of the timing, rates, and anatomical distribution of brain structure changes in adolescents with schizophrenia.

Each of the 12 adolescents was scanned repeatedly with high-resolution MRIs over a five-year period, beginning when the teenagers were about 14. The adolescents were carefully matched with healthy teens of the same gender, age, socioeconomic background, and height. The findings of this important study are featured in the Focus on Neuroscience.

Although there is evidence that brain abnormalities are found in schizophrenia, such findings do not prove that brain abnormalities are the sole cause of schizophrenia. First, some people with schizophrenia do *not* show brain structure abnormalities. Second, the evidence is correlational. Researchers are still investigating whether differences in brain structures and activity are the cause or the consequence of schizophrenia. Third, the kinds of brain abnormalities seen in schizophrenia are also seen in other mental disorders. Rather than specifically causing schizophrenia, it's quite possible that brain abnormalities might contribute to psychological disorders in general.

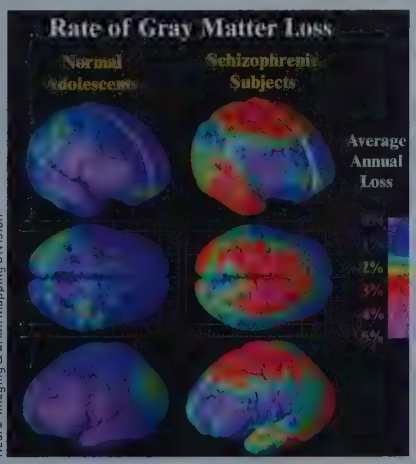
FOCUS ON NEUROSCIENCE

Schizophrenia: A Wildfire in the Brain

In a five-year prospective study, neuroscientist Paul Thompson and his colleagues (2001) used high-resolution brain scans to map brain structure changes in normal adolescents and adolescents with early-onset schizophrenia. Thompson found marked differences in the brain development of normal teens and teens with schizophrenia. As expected, the healthy teenagers showed a gradual, small loss of gray matter—about 1 percent—over the five-year study. This loss is due to the normal pruning of unused brain connections that takes place during adolescence (see Chapter 9).

But in sharp contrast to the normal teens, the teenagers with schizophrenia showed a severe loss of gray matter that developed in a specific, wavelike pattern. The loss began in the parietal lobes and, over the five years of the study, progressively spread forward to the temporal and frontal regions. As Thompson (2001) noted, "We were stunned to see a spreading wave of tissue loss that began in a small region of the brain. It moved across the brain like a forest fire, destroying more tissue as the disease progressed."

The brain images show the average rate of gray matter loss over the five-year period. Gray matter loss ranged from about 1 percent (blue) in the normal teens to more than 5 percent (pink) in the schizophrenic teens. One fascinating finding was that the amount of gray matter loss was directly correlated to the teenage patients' clinical symptoms. Psychotic symptoms increased the most in the participants who lost the greatest quantity of gray matter.



Courtesy of Dr. Paul Thompson, Dept. of Neurology, UCLA Lab of Neuro Imaging & Brain Mapping Division

Also, the *pattern* of loss mirrored the progression of neurological and cognitive deficits associated with schizophrenia. For example, more rapid gray matter loss in the *temporal lobes* was associated with more severe *positive* symptoms, such as hallucinations and delusions. More rapid loss of gray matter in the *frontal lobes* was strongly correlated with the severity of *negative* symptoms, including flat affect and poverty of speech. When the participants were 18 to 19 years old and the final brain scans were taken, the patterns of gray matter loss were similar to those found in the brains of adult patients with schizophrenia.

Despite the wealth of information generated by Thompson's study, the critical question remains unanswered: What sparks the cerebral forest fire in the schizophrenic brain?

dopamine hypothesis The view that schizophrenia is related to, and may be caused by, excessive activity of the neurotransmitter dopamine in the brain.

Abnormal Brain Chemistry

The Dopamine Hypothesis

According to the **dopamine hypothesis,** schizophrenia is related to excessive activity of the neurotransmitter dopamine in the brain. Two pieces of indirect evidence support this notion. First, antipsychotic drugs, such as Haldol, Thorazine, and Stelazine, *reduce or block dopamine activity in the brain.* These drugs reduce schizophrenic symptoms, especially positive symptoms, in many people. Second, drugs that enhance dopamine activity in the brain, such as amphetamines and cocaine, can produce schizophrenia-like symptoms in normal adults or increase symptoms in people who already have schizophrenia.

However, there is also evidence that contradicts the dopamine hypothesis. For example, not all individuals who have schizophrenia experience a reduction of symptoms in response to the antipsychotic drugs that reduce dopamine activity in the brain. And for many patients, these drugs reduce some but not all schizophrenic symptoms. One new theory is that some parts of the brain, such as the limbic system, may have too much dopamine, while other parts of the brain, such as the cortex, may have too little (Combs & Mueser, 2007; Kendler & Schaffner, 2011). Thus, the connection between dopamine and schizophrenia symptoms remains unclear.

Psychological Factors

Unhealthy Families

Researchers have investigated such factors as dysfunctional parenting, disturbed family communication styles, and critical or guilt-inducing parental styles as possible contributors to schizophrenia (Johnson & others, 2001). However, no single psychological factor seems to emerge consistently as causing schizophrenia. Rather, it seems that those who are genetically predisposed to develop schizophrenia may be more vulnerable to the effects of disturbed family environments (Tienari & Wahlberg, 2008).

Strong support for this view comes from a landmark study conducted by Finnish psychiatrist Pekka Tienari and his colleagues (1987, 1994). In the Finnish Adoptive Family Study of Schizophrenia, researchers followed about 150 adopted individuals whose biological mothers had schizophrenia. As part of their study, the researchers assessed the adoptive family's degree of psychological adjustment, including the mental health of the adoptive parents. The study also included a control group of about 180 adopted individuals whose biological mothers did *not* have schizophrenia.

Tienari and his colleagues (1994, 2006; Wynne & others, 2006) found that adopted children with a schizophrenic biological mother had a much higher rate of schizophrenia than did the children in the control group. However, this was true *only* when the children were raised in a psychologically disturbed adoptive home. As you can see in Figure 14.7, when children with a genetic background of schizophrenia were raised in a psychologically healthy adoptive family, they were *no more likely* than the control-group children to develop schizophrenia.

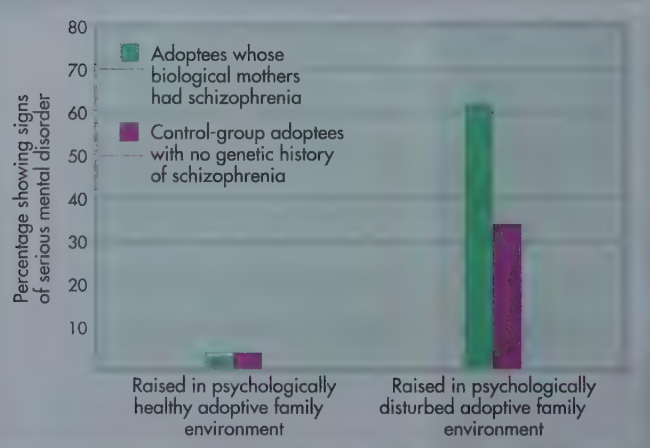


FIGURE 14.7 The Finnish Adoptive Family Study of Schizophrenia In the Finnish Adoptive Family Study, psychiatrist Pekka Tienari and his colleagues (1994, 2006) tracked the mental health of two groups of adopted individuals: one group with biological mothers who had schizophrenia and a control group whose biological mothers did not have schizophrenia. This graph shows the strong influence of the adoptive family environment on the development of serious mental disorders.

Although adopted children with no genetic history of schizophrenia were less vulnerable to the psychological stresses of a disturbed family environment, they were by no means completely immune to such influences. As Figure 14.7 shows, one-third of the control-group adoptees developed symptoms of a serious psychological disorder if they were raised in a disturbed family environment.

Tienari's study underscores the complex interaction of genetic and environmental factors. Clearly, children who were genetically at risk to develop schizophrenia benefited from being raised in a healthy psychological environment. Put simply, a healthy psychological environment may counteract a person's

inherited vulnerability for schizophrenia. Conversely, a psychologically unhealthy family environment can act as a catalyst for the onset of schizophrenia, especially for those individuals with a genetic history of schizophrenia (Tienari & Wahlberg, 2008).

After more than a century of intensive research, schizophrenia remains a baffling disorder. Thus far, no single biological, psychological, or social factor has emerged as the causal agent in schizophrenia. Nevertheless, researchers are expressing greater confidence that the pieces of the schizophrenia puzzle are beginning to form a more coherent picture.

Even if the exact causes of schizophrenia remain elusive, there is still reason for optimism. In the past few years, new antipsychotic drugs have been developed that are much more effective in treating both the positive and negative symptoms of schizophrenia (Sharif & others, 2007). In the next chapter, we'll take a detailed look at the different treatments and therapies for schizophrenia and other psychological disorders.

CONCEPT REVIEW 14.3

Personality Disorders, Dissociative Disorders, and Schizophrenia

Match each example below with one of the following psychological disorders: dissociative fugue, dissociative identity disorder, antisocial personality disorder, borderline personality disorder, paranoid schizophrenia, catatonic schizophrenia.

1. Jay, a high school physics teacher in New York City, disappeared three days after his wife unexpectedly left him. Six months later, he was discovered tending bar in Miami Beach. Calling himself Martin, he claimed to have no recollection of his past life. _____
2. Bob was fired from yet another job, this time for stealing and forging payroll checks. "They were so stupid at that place, they deserved to lose that money," he bragged to his girlfriend. _____
3. Norma has frequent memory gaps and cannot account for her whereabouts during certain periods of time. While being interviewed by a clinical psychologist, she began speaking in a child-like voice. She claimed that her name was Donna and that she was only 6 years old. Moments later, she seemed to revert to her adult voice and had no recollection of claiming that her name was Donna. _____
4. After getting the manager to let them into her apartment, Sylvia's parents found her standing motionless near a window and completely unresponsive to their presence. _____
5. Leslie seems charming and vivacious when you first meet her, but you soon discover that she is extremely moody, jealous, and possessive; terrified of being alone; and prone to self-destructive behavior. _____
6. By the time the neighbors called the police, Dwight had barricaded all the doors and windows of his house because the voices had told him that aliens were coming to kidnap him. _____



CLOSING THOUGHTS

In this chapter, we've looked at the symptoms and causes of several psychological disorders. We've seen that some of the symptoms of psychological disorders represent a sharp break from normal experience. The behavior of the young woman in the Prologue is an example of the severely disrupted functioning characteristic of schizophrenia. In contrast, the symptoms of other psychological disorders, such as the mood disorders, differ from normal experience primarily in their degree, intensity, and duration.

Psychologists are only beginning to understand the causes of many psychological disorders. The broad picture that emerges reflects a familiar theme: Biological, psychological, and social factors all contribute to the development of psychological disorders. In the next chapter, we'll look at how psychological disorders are treated.

In the final section, Enhancing Well-Being with Psychology, we'll explore one of the most serious consequences of psychological problems—suicide. Because people who are contemplating suicide often turn to their friends before they seek help from a mental health professional, we'll also suggest several ways in which you can help a friend who expresses suicidal intentions.

ENHANCING WELL-BEING WITH PSYCHOLOGY

Understanding and Helping to Prevent Suicide

Who Commits Suicide?

Suicide and attempted suicide are all too common. Each year in the United States about 30,000 people take their own lives. For every death by suicide, it's estimated that 25 people have attempted suicide (American Association of Suicidology, 2004). In any given year, some 500,000 people require emergency room treatment as a result of attempted suicide (McCaig & Burt, 2004).

Most people don't realize that more than twice as many Americans die each year from suicide as from homicide. In 2009, suicide was the 10th leading cause of death, while homicide ranked 15th (Kochanek & others, 2011).

Women outnumber men by three to one in the number of suicide attempts. However, men outnumber women by more than four to one in suicide deaths, primarily because men tend to use more lethal methods, such as shooting and hanging (Kochanek & Smith, 2004).

Suicide is the third leading cause of death for young people ages 15 to 24. Over the past four decades, the suicide rate for adolescents and young adults has increased by almost 300 percent (U.S. Public Health Service, 1999). Although this trend has received considerable media attention, the suicide rate of adolescents and young adults is still below that of older adults. In fact, the highest suicide rate consistently occurs in the oldest segments of our population—among those aged 75 and above (Kochanek & Smith, 2004).

A notion that is often perpetuated in the popular press is that there is a significant increase in the number of suicides during the winter holidays. This claim is a myth, plain and simple. However, there are consistent seasonal variations in suicide deaths. In the United States, suicide rates are lowest during the winter months and highest in the spring (Romer & others, 2003).

On average, someone commits suicide in the United States every 17 minutes. It is estimated that each suicide affects the lives of at least six other people.

What Risk Factors Are Associated with Suicidal Behavior?

Hundreds of studies have identified psychosocial and environmental factors associated with an increased risk of suicidal behavior (e.g., Brown & others, 2004; Gould & others, 2003; Joiner & others, 2005; Lieb & others, 2005). Factors that increase the risk of suicidal behavior include:

- Feelings of hopelessness and social isolation
- Recent relationship problems or a lack of significant relationships
- Poor coping and problem-solving skills
- Poor impulse control and impaired judgment
- Rigid thinking or irrational beliefs
- A major psychological disorder, especially depression, bipolar disorder, or schizophrenia
- Alcohol or other substance abuse
- Childhood physical or sexual abuse
- Prior self-destructive behavior
- A family history of suicide
- Presence of a firearm in the home

Why Do People Attempt or Commit Suicide?

The suicidal person's view of life has become progressively more pessimistic and negative. At the same time, his view of self-inflicted death as an alternative to life becomes progressively more acceptable and positive (Shneidman, 1998, 2004).

Some people choose suicide to escape the pain of a chronic illness or the slow, agonizing death of a terminal disease. Others commit suicide because of feelings of hopelessness, depression, guilt, rejection, failure, humiliation, or shame (Lester, 1997; 2010). The common denominator is that they see suicide as the only escape from their own unbearably painful emotions (Jamison, 2000; Lester, 2010).

When faced with a dilemma, the average person tends to see a range of possible solutions, accepting the fact that none of the solutions may be ideal. In contrast, the suicidal person's thinking and perceptions have become rigid and constricted. She can see only two ways to solve her problems: a magical resolution or suicide. Because she cannot imagine a realistic way of solving her problems, death seems to be the only logical option (Shneidman, 1998, 2004).

How Can You Help Prevent Suicide?

If someone is truly intent on taking his or her own life, it may be impossible to prevent him or her from doing so. But that does not mean that you can't try to help a friend who is expressing suicidal intentions. People often turn to their friends rather than to mental health professionals. If a friend confides that he or she is feeling hopeless and suicidal, these guidelines may help you help your friend.

It's important to stress, however, that these guidelines are meant only to help you provide "psychological first aid" in a crisis situation. They do *not* qualify you as a suicide prevention expert. Your goal is to help your friend weather the immediate crisis so that he or she can be directed to a mental health professional.



SomosVeer/Getty Images

How to Help a Friend The majority of those who attempt suicide communicate their intentions to friends or family members (Shneidman, 1998). When a friend is despondent and desperate, you can help by listening, expressing your understanding and compassion, and, if necessary, referring him to a professional counselor or suicide prevention specialist.

Guideline 1: Actively listen as the person talks and vents her feelings. The suicidal person often feels isolated or lonely, with few sources of social support (Joiner, 2010). Let the person talk, and try to genuinely empathize with your friend's feelings. An understanding friend who is willing to take the time to listen patiently without passing judgment may provide just the support the person needs to overcome the immediate suicidal feelings. Hearing themselves talk can also help suicidal individuals identify and better understand their own feelings.

> So ubiquitous is the impulse to commit suicide that one out of every two Americans has at some time considered, threatened, or actually attempted suicide.
>
> *David Lester*

Guideline 2: Don't deny or minimize the person's suicidal intentions. Brushing aside suicidal statements with platitudes, like "Don't be silly, you've got everything to live for," or clichés, like "Every cloud has a silver lining," is not a helpful response. This is *not* the time to be glib, patronizing, or superficial. Instead, ask your friend if she wants to talk about her feelings. Try to be matter-of-fact and confirm that she is indeed seriously suicidal, rather than simply exaggerating her frustration or disappointment.

How can you confirm that the person is suicidal? Simply ask her, "Are you really thinking about killing yourself?" Talking about specific suicide plans (how, when, and where), giving away valued possessions, and putting her affairs in order are some indications that a person's suicidal intentions are serious.

Guideline 3: Identify other potential solutions. The suicidal person is operating with psychological blinders that prevent him from seeing alternative courses of action or other ways of looking at his problems. How can you remove those blinders? Simply saying, "Here are some options you may not have thought about" is a good starting point. You might list alternative solutions to the person's problems, helping him to understand that other potential solutions do exist, even though none may be perfect (Shneidman, 1998).

Guideline 4: Ask the person to delay his decision. Most suicidal people are ambivalent about wanting to die. If your friend did not have mixed feelings about committing suicide, he probably wouldn't be talking to you. If he is still intent on suicide after talking about other alternatives, ask him to *delay* his decision. Even a few days' delay may give the person enough time to psychologically regroup, consider alternatives, or seek help.

Guideline 5: Encourage the person to seek professional help. If the person is seriously suicidal and may harm herself in the near future, do *not* leave her alone. The most important thing you can do is help to get the person referred to a mental health professional for evaluation and treatment. If you don't feel you can do this alone, find another person to help you.

There are any number of resources you can suggest, including local suicide hotlines or mental health associations, the college counseling service, and the person's family doctor or religious adviser. You can also suggest calling 1-800-SUICIDE (1-800-784-2433), which will connect you with a crisis center in your area.



CHAPTER REVIEW

Psychological Disorders

KEY POINTS

Introduction: Understanding Psychological Disorders

- Distinguishing "normal" from "abnormal" behavior involves consideration of many different factors, including cultural norms. **Psychopathology** refers to the scientific study of the origins, symptoms, and development of psychological disorders.
- A **psychological disorder,** or **mental disorder,** is a pattern of behavioral or psychological symptoms that causes significant personal distress and/or impairs the ability to function. The diagnostic criteria for specific psychological disorders are described in **DSM-IV-TR,** which has been criticized for gender bias, cultural bias, and for pathologizing normal behavior and experiences. The next edition of the manual, DSM-5, is currently in development.
- The prevalence of psychological disorders is much higher than had previously been thought. According to one comprehensive survey, approximately one in two Americans will experience a psychological disorder at some point in their lifetimes, and approximately one in four Americans has experienced the symptoms of a psychological disorder in the previous year. Comorbidity is common, meaning that many people are diagnosed with more than one disorder.

Anxiety Disorders: Intense Apprehension and Worry

- In contrast to normal **anxiety, anxiety disorders** consist of irrational and uncontrollable feelings that are unreasonably intense, frequent, persistent, and disruptive.
- **Generalized anxiety disorder (GAD)** and **panic disorder** are characterized by intense anxiety that is not triggered by a specific stimulus. Generalized anxiety disorder involves a constant, persistent state of anxiety. Panic disorder involves sudden episodes of extreme, intense anxiety, which are called **panic attacks. Agoraphobia** is fear of having a panic attack in a public or inescapable situation.
- The **phobias** involve intense and irrational fear, and avoidance of the feared object or situation. Important forms of phobias include **specific phobia** and **social phobia (social anxiety disorder).** Learning theories and evolved biological predispositions have been offered as explanations of the development of phobias.
- **Post-traumatic stress disorder (PTSD)** develops in response to an extreme psychological or physical trauma. Symptoms include frequent intrusive memories of the trauma, avoidance, emotional numbness, and increased physical arousal.

- **Obsessive–compulsive disorder** is an anxiety disorder in which a person's life is dominated by repetitive thoughts (**obsessions**) and actions (**compulsions**). Biological factors that have been implicated in obsessive–compulsive disorder include serotonin deficiency and brain dysfunction.

Mood Disorders: Emotions Gone Awry

- **Mood disorders,** also called *affective disorders,* involve serious, persistent disturbances in emotions that cause psychological discomfort and/or impair the ability to function.
- The symptoms of **major depression** include negative emotions, extreme pessimism, thoughts of suicide, cognitive impairment, lack of motivation, and sleep disruption for a period of two weeks or longer. **Dysthymic disorder** is a milder but chronic form of depression.
- Major depression is the most common psychological disorder. Left untreated, depression may recur and become progressively more severe. **Seasonal affective disorder (SAD)** generally occurs with the onset of the fall and winter months, and is associated with lesser amounts of sunlight.
- **Bipolar disorder** usually involves periods of depression alternating with **manic episodes.** A milder form of bipolar disorder is **cyclothymic disorder.** Bipolar disorder is less common than major depression.
- Genetics, brain chemistry, and stress have all been implicated in mood disorders. The neurotransmitters serotonin and norepinephrine have been implicated in depression. Another neurotransmitter, glutamate, may be involved in bipolar disorder.

Eating Disorders: Anorexia and Bulimia

- Eating disorders are serious and maladaptive disturbances in eating behavior. **Anorexia nervosa** is defined by the refusal to maintain a normal body weight, an irrational fear of gaining weight, and distorted perceptions about body size.
- **Bulimia nervosa** involves episodes of bingeing and purging. People with this eating disorder typically maintain a normal body weight.
- Eating disorders are more common in females. Factors that contribute to the development of eating disorders include genetics and disruptions of neurotransmitters and other chemical signals that normally regulate eating behavior. Cultural attitudes also contribute to eating disorders.

Personality Disorders: Maladaptive Traits

- **Personality disorders** are characterized by inflexible, maladaptive patterns of thoughts, emotions, behavior, and interpersonal functioning. These traits are stable over time and across situations, and deviate from the social and behavioral expectations of the individual's culture.
- Personality disorders are grouped into three clusters: the odd, eccentric cluster; the dramatic, emotional, erratic cluster; and the anxious, fearful cluster.
- **Paranoid personality disorder** is characterized by a pervasive distrust and suspiciousness of the motives of others. Others are perceived as trying to exploit or deceive the person. Inappropriate outbursts of anger, blaming others for the person's own inadequacies, and pathological jealousy are common features of this disorder.
- **Antisocial personality disorder** is characterized by a pervasive pattern of disregarding and violating the rights of others. People with this personality disorder habitually deceive and manipulate others for their own gain. A history of substance abuse, arrests, and other irresponsible behaviors is common. Multiple factors seem to be involved in the development of antisocial personality disorder.
- **Borderline personality disorder** is characterized by instability of interpersonal relationships, self-image, and emotions. Mood swings, impulsive actions, self-destructive tendencies, and substance abuse are common features. Factors that seem to contribute to the development of this disorder include parental neglect or abuse during childhood.

The Dissociative Disorders: Fragmentation of the Self

- **Dissociative experiences** involve a disruption in awareness, memory, and personal identity. In the **dissociative disorders,** however, dissociative experiences are extreme, frequent, and disruptive.
- **Dissociative amnesia** is characterized by the inability to recall important information which is not due to a medical condition and cannot be explained by ordinary forgetfulness. **Dissociative fugue** involves amnesia and sudden, unexplained travel away from home.
- **Dissociative identity disorder (DID)** involves memory gaps and the presence of two or more distinct identities. Some psychologists are skeptical of dissociative identity disorder. According to one theory, DID is caused by trauma in childhood and represents an extreme form of coping through dissociation.

Schizophrenia: A Different Reality

- **Schizophrenia** is a psychological disorder that involves severely distorted beliefs, perceptions, and thought processes.
- The **positive symptoms** of schizophrenia represent excesses in normal functioning. They include **delusions, hallucinations,** and severely disorganized thought processes, speech, and behavior. **Negative symptoms** reflect deficits or decreases in normal functioning. They include flat affect, alogia, and avolition.
- Three subtypes of schizophrenia are the paranoid type, the catatonic type, and the disorganized type, each of which is distinguished by a particular combination of symptoms. When the pattern of symptoms does not match any of these three subtypes, the diagnosis of undifferentiated type is made.
- The course of schizophrenia is highly variable. Schizophrenia becomes chronic in about one-half of the people who experience a schizophrenic episode. About one-quarter recover completely, and about one-quarter experience recurrent episodes but are able to function with minimal impairment.
- Family, twin, and adoption studies have shown that genetics contributes to the development of schizophrenia. However, studies of identical twins demonstrate that nongenetic factors play at least an equal role in the development of schizophrenia. Non-inherited genetic factors are probably involved in schizophrenia, as researchers have found that genetic mutations are much more common in people with schizophrenia. Bipolar disorder and schizophrenia seem to share some common genetic markers. Although genetics is clearly implicated in the development of schizophrenia, no specific gene or pattern of genetic variation has been found to be clearly predictive of

schizophrenia. The risk of schizophrenia is higher in the offspring of older fathers.

- According to the **dopamine hypothesis,** excess dopamine in the brain may be associated with schizophrenia. Along with abnormal brain chemistry, abnormalities in brain structure and function have been identified as factors associated with schizophrenia.
- Environmental factors that may be involved in schizophrenia include exposure to a virus during prenatal development and a psychologically unhealthy family environment. Adopted children who were genetically at risk to develop schizophrenia were found to be less likely to develop the disorder when raised in a psychologically healthy family.

KEY TERMS

psychopathology, p. 561
psychological disorder (mental disorder), p. 561
DSM-IV-TR, p. 561
anxiety, p. 566
anxiety disorders, p. 567
generalized anxiety disorder (GAD), p. 567
panic attack, p. 568
panic disorder, p. 568
agoraphobia, p. 568
phobia, p. 569
specific phobia, p. 569
social phobia (social anxiety disorder), p. 570
post-traumatic stress disorder (PTSD), p. 571
obsessive-compulsive disorder (OCD), p. 572
obsessions, p. 573
compulsions, p. 573
mood disorders, p. 575
major depression, p. 576
seasonal affective disorder (SAD), p. 577
dysthymic disorder, p. 577
bipolar disorder, p. 578
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dissociative amnesia, p. 589
dissociative fugue, p. 590
dissociative identity disorder (DID), p. 590
schizophrenia, p. 592
positive symptoms, p. 592
negative symptoms, p. 592
delusion, p. 593
hallucination, p. 593
dopamine hypothesis, p. 600

CONCEPT REVIEW ANSWERS

14.1 page 575

1. post-traumatic stress disorder
2. generalized anxiety disorder
3. panic disorder
4. specific phobia
5. obsessive-compulsive disorder
6. social phobia

14.2 page 584

1. seasonal affective disorder (SAD)
2. bulimia nervosa
3. dysthymic disorder
4. bipolar disorder
5. major depression
6. anorexia nervosa
7. cyclothymic disorder

14.3 page 601

1. dissociative fugue
2. antisocial personality disorder
3. dissociative identity disorder
4. catatonic schizophrenia
5. borderline personality disorder
6. paranoid schizophrenia



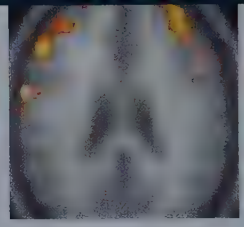
Web Companion Review Activities

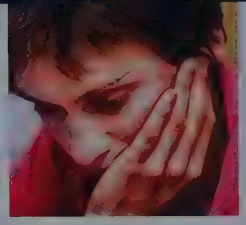
You can find additional review activities at www.worthpublishers.com/hockenbury6e

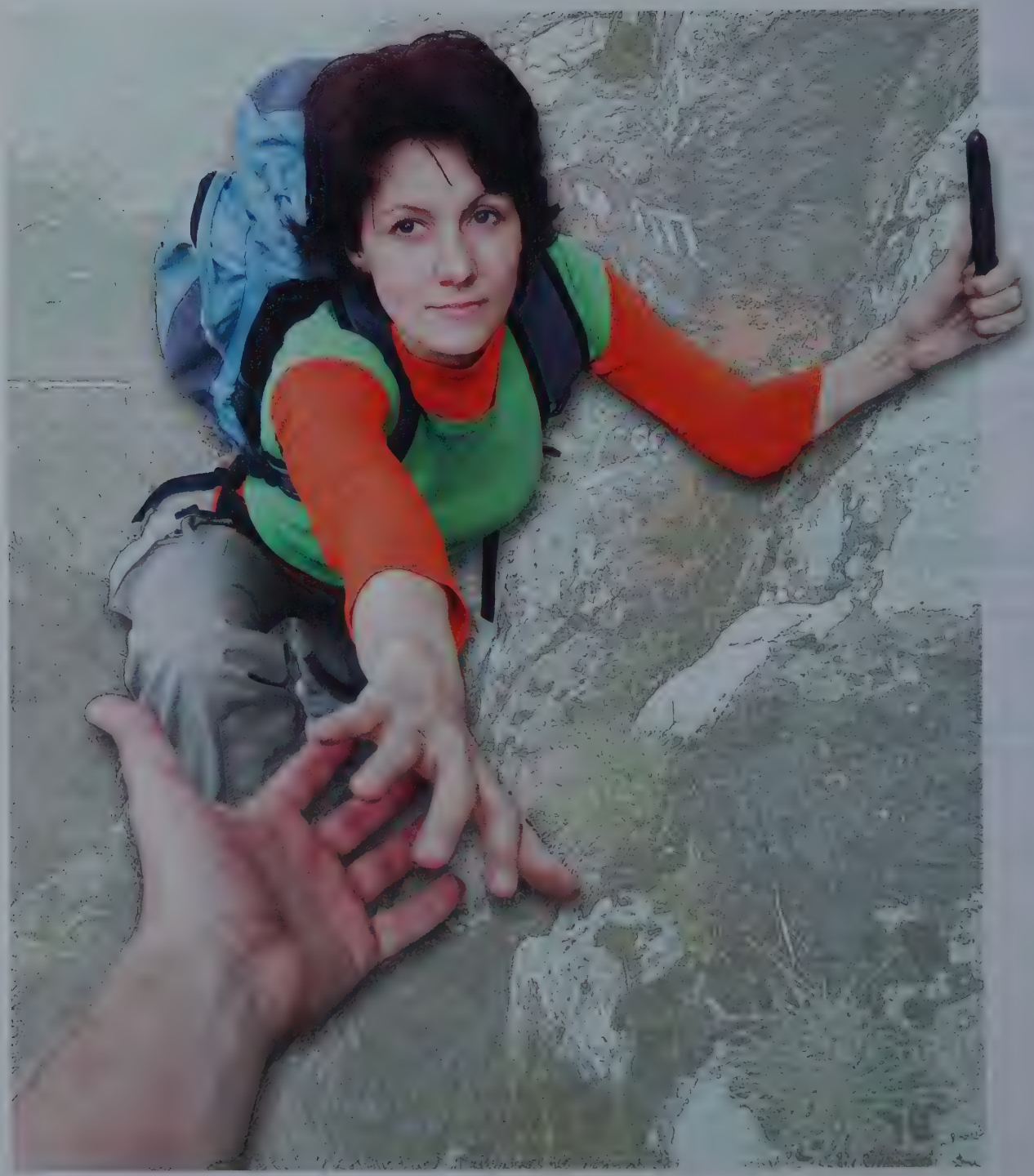
The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.

CHAPTER 15

Therapies











"A Clear Sense of Being Heard . . ."

PROLOGUE

HOW WOULD WE DESCRIBE MARCIA? She's an extraordinarily kind, intelligent woman. Her thoughtfulness and sensitivity are tempered by a ready laugh and a good sense of humor. She's happily married, has a good job as a feature writer for a large suburban newspaper, and has two young children, who only occasionally drive her crazy. If Marcia has a flaw, it's that she tends to judge herself much too harshly. She's too quick to blame herself when anything goes wrong.

Juggling a full-time career, marriage, and parenting is a challenge for anyone, but Marcia always makes it look easy. The last time we had dinner at Bill and Marcia's home, the meal featured homegrown vegetables, made-from-scratch bread, and fresh seasonings from the herb pots in the kitchen. Outwardly, Marcia appears to have it all. But a few years ago, she began to experience a pervasive sense of dread and unease—feelings that gradually escalated into a full-scale depression. Marcia describes the onset of her feelings in this way:

> Physically, I began to feel as if I were fraying around the edges. I had a constant sense of anxiety and a recurring sense of being a failure. My daughter, Maggie, was going through a rather difficult stage. Andy was still a baby. I felt worn out. I started worrying constantly about my children. Are they safe? Are they sick? What's going to happen? Are my kids going to get hurt? I knew that I really didn't have any reason to worry that much, but I did. It finally struck me that my worrying and my anxiety and my feelings of being a failure were not going to go away on their own.

Marcia decided to seek help. She made an appointment with her therapist, a psychiatrist whom Marcia had last seen 10 years earlier, when she had helped Marcia cope with a very difficult time in her life. Marcia summarizes her experience this way:

> How has therapy helped me? My feelings before a therapy session may vary greatly, depending on the issue under discussion. However, I always find the sessions cathartic and I invariably feel great relief. I feel a sense of being understood by someone who knows me but who is detached from me. I have a clear sense of being heard, as though my therapist has given me a gift of listening and of allowing me to see myself as the worthwhile and capable person I am. It is as though therapy allows me to see more clearly into a mirror that my problems have obscured.

Over the course of several months, Marcia gradually began to feel better. Today, Marcia is calmer, more confident, and feels much more in control of her emotions

IN THIS CHAPTER:

- Introduction: Psychotherapy and Biomedical Therapy
- Psychoanalytic Therapy
- Humanistic Therapy
- Behavior Therapy
- Cognitive Therapies
- Group and Family Therapy
- Evaluating the Effectiveness of Psychotherapy
- Biomedical Therapies
- ENHANCING WELL-BEING WITH PSYCHOLOGY: What to Expect in Psychotherapy

and her life. As Marcia's mental health improved, so did her relationships with her children and her husband.

> Psychotherapy has also helped me communicate more clearly. It has enabled me to become more resilient after some emotional conflict. It has had a preventive effect in helping me to ignore or manage situations that might under certain circumstances trigger depression, anxiety, or obsessive worry. And it makes me a better parent and marriage partner.
>
> Therapy's negative effects? I'm poorer; it costs money. And therapy poses the risk of becoming an end in itself. Psychotherapy has the attraction of being a safe harbor from the petty assaults of everyday life. There's always the danger of losing sight of the goal of becoming a healthier and more productive person, and becoming stuck in the therapy process.

Marcia's experience with psychotherapy reflects many of the themes we will touch on in this chapter. We'll look at different forms of therapy that psychologists and other mental health professionals use to help people cope with psychological problems. We'll also consider the popularity of self-help groups and how they differ from more structured forms of therapy. Toward the end of the chapter, we'll discuss biomedical approaches to the treatment of psychological disorders. Over the course of the chapter, we'll come back to Marcia's story.



Introduction: Psychotherapy and Biomedical Therapy

KEY THEME

- Two forms of therapy are used to treat psychological disorders and personal problems—psychotherapy and the biomedical therapies.

KEY QUESTIONS

- What is psychotherapy, and what is its basic assumption?
- What is biomedical therapy, and how does it differ from psychotherapy?

People seek help from mental health professionals for a variety of reasons. Like Marcia, many people seek help because they are suffering from some form of a *psychological disorder*—troubling thoughts, feelings, or behaviors that cause psychological discomfort or interfere with a person's ability to function.

But not everyone who seeks professional help is suffering from a psychological disorder. Many people seek help in dealing with troubled relationships, such as parent–child conflicts or an unhappy marriage. And sometimes people need help with life's transitions, such as coping with the death of a loved one, dissolving a marriage, or adjusting to retirement.

In this chapter, we'll look at the two broad forms of therapy that mental health professionals use to help people: *psychotherapy* and *biomedical therapy*. **Psychotherapy** refers to the use of psychological techniques to treat emotional, behavioral, and interpersonal problems. While there are many different types of psychotherapy, they all share the assumption that psychological factors play a significant role in a person's troubling feelings, behaviors, or relationships. Table 15.1 summarizes the diverse range of mental health professionals who use psychotherapy techniques to help people.

In contrast to psychotherapy, the **biomedical therapies** involve the use of medication or other medical treatments to treat the symptoms associated with psychological disorders. Drugs that are used to treat psychological or mental disorders are termed *psychotropic medications*. The biomedical therapies are based on the assumption that the symptoms of many psychological disorders involve biological factors, such as abnormal brain chemistry. As we saw in Chapter 14, the involvement of biological factors in many psychological disorders is well documented. Treating psychological disorders with a combination of psychotherapy and biomedical therapy, especially psychotropic medications, has become increasingly common (Cuijpers & others, 2009; Sudak, 2011). Until very recently, only licensed physicians were legally allowed to prescribe psychotropic medications.



Don Bayley/istockphoto

Seeking Help People enter psychotherapy for many different reasons. Some people seek to overcome severe psychological disorders, while others want to learn how to cope better with everyday challenges or relationship problems. And, for some people, the goal of therapy is to attain greater self-knowledge or personal fulfillment.

TABLE 15.1

Who's Who Among Mental Health Professionals

Clinical psychologist	Holds an academic doctorate (Ph.D., Psy.D., or Ed.D.) and is required to be licensed to practice. Assesses and treats mental, emotional, and behavioral disorders. Has expertise in psychological testing and evaluation, diagnosis, psychotherapy, research, and prevention of mental and emotional disorders. May work in private practice, hospitals, or community mental health centers.
Counseling psychologist	Holds an academic doctorate and must be licensed to practice. Assesses and treats mental, emotional, and behavioral problems and disorders, but usually disorders that are of lesser severity.
Psychiatrist	Holds a medical degree (M.D. or D.O.) and is required to be licensed to practice. Has expertise in the diagnosis, treatment, and prevention of mental and emotional disorders. Often has training in psychotherapy. May prescribe medications, electroconvulsive therapy, or other medical procedures.
Psychoanalyst	Usually a psychiatrist or clinical psychologist who has received additional training in the specific techniques of psychoanalysis, the form of psychotherapy originated by Sigmund Freud.
Licensed professional counselor	Holds at least a master's degree in counseling, with extensive supervised training in assessment, counseling, and therapy techniques. May be certified in specialty areas. Most states require licensure or certification.
Psychiatric social worker	Holds a master's degree in social work (M.S.W.). Training includes an internship in a social service agency or mental health center. Most states require certification or licensing. May or may not have training in psychotherapy.
Marriage and family therapist	Usually holds a master's degree, with extensive supervised experience in couple or family therapy. May also have training in individual therapy. Many states require licensing.
Psychiatric nurse	Holds an R.N. degree and has selected psychiatry or mental health nursing as a specialty area. Typically works on a hospital psychiatric unit or in a community mental health center. May or may not have training in psychotherapy.

psychotherapy The treatment of emotional, behavioral, and interpersonal problems through the use of psychological techniques designed to encourage understanding of problems and modify troubling feelings, behaviors, or relationships.

biomedical therapies The use of medications, electroconvulsive therapy, or other medical treatments to treat the symptoms associated with psychological disorders.



Photo by R. Dylan Thompson

Prescribing Psychologist Elaine LeVine New Mexico psychologist Elaine LeVine (2007) was one of the first psychologists to acquire prescription privileges in the United States. When New Mexico passed the legislation making licensed psychologists eligible for prescription privileges, a key goal was to increase rural access to mental health care. Like other prescribing psychologists, Dr. LeVine uses the therapeutic relationship she builds with patients to help educate and involve them in treatment decisions about the medications she prescribes. As LeVine (2007) explains, "The psychologist's close relationship with the patient, combined with thorough communication with the medical provider, can offer more integrated and thorough care."

However, that tradition may be changing. Since the 1990s, a movement to allow specially trained psychologists to prescribe has achieved some success. It began with the U.S. Department of Defense conducting a successful pilot program in which 10 military psychologists were given intensive training in prescribing psychotropic medications to treat psychological disorders (Ax & others, 2008). The success of the Department of Defense program was one of the factors that persuaded New Mexico lawmakers to enact legislation in 2002 that permitted licensed psychologists to acquire additional training to prescribe psychotropic medications. In 2004, Louisiana became the second state to grant prescription-writing privileges to properly trained psychologists. Similar legislation is pending in several other states (McGrath, 2010; McGrath & Sammons, 2011). And, a recent survey of psychology professionals in Canada found that a majority favored extending prescription privileges to Canadian clinical psychologists who were properly trained (St-Pierre & Melnyk, 2004).

However, not all psychologists favor the idea of extending prescription privileges to qualified psychologists (see Heiby & others, 2004; Heiby, 2010). Some argue that clinical psychologists should focus on what they do best: providing psychological interventions and treatments that help people acquire more effective patterns of thinking and behaving. Others are concerned that the safety and well-being of patients could be at risk if psychologists receive inadequate training to prescribe psychotropic medications (Lavoie & Barone, 2006).

We'll begin this chapter by surveying some of the most influential approaches in psychotherapy: psychoanalytic, humanistic, behavioral, and cognitive. Each approach is based on different assumptions about the underlying causes of psychological problems. And each approach uses different strategies to produce beneficial changes in the way a person thinks, feels, and behaves—the ultimate goal of all forms of psychotherapy. After discussing the effectiveness of psychotherapy, we'll look at the most commonly used biomedical treatments for psychological disorders.



Psychoanalytic Therapy

KEY THEME

› Psychoanalysis is a form of therapy developed by Sigmund Freud and is based on his theory of personality.

KEY QUESTIONS

› What are the key assumptions and techniques of psychoanalytic therapy?

› How do short-term dynamic therapies differ from psychoanalysis, and what is interpersonal therapy?

When cartoonists portray a psychotherapy session, they often draw a person lying on a couch and talking while a bearded gentleman sits behind the patient, passively listening. This stereotype reflects some of the key ingredients of traditional **psychoanalysis,** a form of psychotherapy originally developed by **Sigmund Freud** in the early 1900s. Although psychoanalysis was developed a century ago, its assumptions and techniques continue to influence many psychotherapies today (Borden, 2009; Lerner, 2008; Luborsky & Barrett, 2006).



Sigmund Freud and Psychoanalytic Therapy At the beginning of the twentieth century, Sigmund Freud (1856–1939) developed an influential form of psychotherapy called psychoanalysis. Traditional psychoanalysis is not widely practiced today, partly because it is too lengthy and expensive. However, many of the techniques that Freud pioneered, such as free association, dream analysis, and transference, are still commonly used in different forms of psychotherapy.

Bettman/Corbis

Sigmund Freud and Psychoanalysis

As a therapy, traditional psychoanalysis is closely interwoven with Freud's theory of personality. As you may recall from Chapter 11, on personality, Freud stressed that early childhood experiences provided the foundation for later personality development. When early experiences result in unresolved conflicts and frustrated urges, these emotionally charged memories are *repressed,* or pushed out of conscious awareness. Although unconscious, these repressed conflicts continue to influence a person's thoughts and behavior, including the dynamics of his relationships with others.

Psychoanalysis is designed to help unearth unconscious conflicts so the patient attains *insight* as to the real source of her problems. Through the intense relationship that develops between the psychoanalyst and the patient, long-standing psychological conflicts are recognized and re-experienced. If the analytic treatment is successful, the conflicts are resolved.

Freud developed several techniques to coax long-repressed memories, impulses, and conflicts to a patient's consciousness (Liff, 1992). In the famous technique called **free association,** the patient spontaneously reports all her thoughts, mental images, and feelings while lying on a couch. The psychoanalyst usually sits out of view, occasionally asking questions to encourage the flow of associations.

Blocks in free association, such as a sudden silence or an abrupt change of topic, were thought to be signs of resistance. **Resistance** is the patient's conscious or unconscious attempts to block the process of revealing repressed memories and conflicts (Luborsky & Barrett, 2006). Resistance is a sign that the patient is uncomfortably close to uncovering psychologically threatening material.

> The resistance accompanies the treatment step by step. Every single association, every act of the person under treatment must reckon with the resistance and represents a compromise between the forces that are striving towards recovery and opposing ones
>
> *–Sigmund Freud (1912)*

Dream interpretation is another important psychoanalytic technique. Because psychological defenses are reduced during sleep, Freud (1911) believed that unconscious conflicts and repressed impulses were expressed symbolically in dream images. Often, the dream images were used to trigger free associations that might shed light on the dream's symbolic meaning.



AP Photo

Freud's Famous Couch During psychoanalytic sessions, Freud's patients would lie on the couch. Freud himself sat at the head of the couch, out of the patient's view. Freud believed that this arrangement encouraged the patient's free flow of thoughts, feelings, and images. Although some traditional psychoanalysts still have the patient lie on a couch, many psychoanalysts today favor comfortable chairs on which analyst and patient sit, facing each other.

More directly, the psychoanalyst sometimes makes carefully timed **interpretations,** explanations of the unconscious meaning of the patient's behavior, thoughts, feelings, or dreams. The timing of such interpretations is important. If an interpretation is offered before the patient is psychologically ready to confront an issue, she may reject the interpretation or respond defensively, increasing resistance (Prochaska & Norcross, 2010).

One of the most important processes that occur in the relationship between the patient and the psychoanalyst is called transference. **Transference** occurs when the patient unconsciously responds to the therapist as though the therapist were a significant person in the patient's life, often a parent. As Freud (1940) explained, "The patient sees in his analyst the return—the reincarnation—of some important figure out of his childhood or past, and consequently transfers on to him the feelings and reactions that undoubtedly applied to this model."

The psychoanalyst encourages transference by purposely remaining as neutral as possible. In other words, the psychoanalyst does not reveal personal feelings, take sides, make judgments, or actively advise the patient. This therapeutic neutrality is designed to produce "optimal frustration" so that the patient transfers and projects unresolved conflicts onto the psychoanalyst (Magnavita, 2008).

As the transference becomes more intense, the patient relives unconscious emotional conflicts that have been repressed since childhood. Only now, these conflicts are being relived and played out in the context of the relationship between the psychoanalyst and the patient.

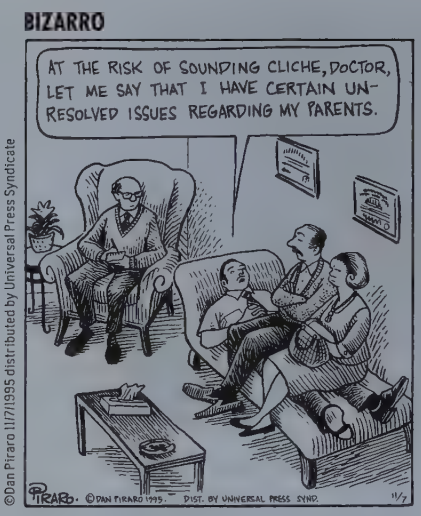
All of these psychoanalytic techniques are designed to help the patient see how past conflicts influence her current behavior and relationships, including her relationship with the psychoanalyst. Once these kinds of insights are achieved, the psychoanalyst helps the patient work through and resolve long-standing conflicts. As resolutions occur, maladaptive behavior patterns that were previously driven by unconscious conflicts can be replaced with more adaptive emotional and behavioral responses.

The intensive relationship between the patient and the psychoanalyst takes time to develop. The traditional psychoanalyst sees the patient three times a week or more, often for years (Schwartz, 2003; Zusman & others, 2007). Freud's patients were on the couch six days a week (Liff, 1992). Obviously, traditional psychoanalysis is a slow, expensive process that few people can afford. For those who have the time and the money, traditional psychoanalysis is still available.

Short-Term Dynamic Therapies

Most people entering psychotherapy today are not seeking the kind of major personality overhaul that traditional psychoanalysis is designed to produce. Instead, people come to therapy expecting help with specific problems. People also expect therapy to provide beneficial changes in a matter of weeks or months, not years.

- **psychoanalysis** A type of psychotherapy originated by Sigmund Freud in which free association, dream interpretation, and analysis of resistance and transference are used to explore repressed or unconscious impulses, anxieties, and internal conflicts.
- **free association** A technique used in psychoanalysis in which the patient spontaneously reports all thoughts, feelings, and mental images as they come to mind, as a way of revealing unconscious thoughts and emotions.
- **resistance** In psychoanalysis, the patient's unconscious attempts to block the revelation of repressed memories and conflicts.
- **dream interpretation** A technique used in psychoanalysis in which the content of dreams is analyzed for disguised or symbolic wishes, meanings, and motivations.
- **interpretation** A technique used in psychoanalysis in which the psychoanalyst offers a carefully timed explanation of the patient's dreams, free associations, or behaviors to facilitate the recognition of unconscious conflicts or motivations.
- **transference** In psychoanalysis, the process by which emotions and desires originally associated with a significant person in the patient's life, such as a parent, are unconsciously transferred onto the psychoanalyst.



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Many different forms of **short-term dynamic therapies** based on traditional psychoanalytic notions are now available (Levenson, 2010, 2011). These short-term dynamic therapies have several features in common. Therapeutic contact lasts for no more than a few months. The patient's problems are quickly assessed at the beginning of therapy. The therapist and patient agree on specific, concrete, and attainable goals. In the actual sessions, most psychodynamic therapists are more directive than are traditional psychoanalysts, actively engaging the patient in a dialogue.

As in traditional psychoanalysis, the therapist uses interpretations to help the patient recognize hidden feelings and transferences that may be occurring in important relationships in her life (Kush, 2009).

One particularly influential short-term psychodynamic therapy is **interpersonal therapy,** abbreviated **IPT.** In contrast to other psychodynamic therapies, interpersonal therapy focuses on *current* relationships and social interactions rather than on past relationships. Originally developed as a brief treatment for depression, interpersonal therapy is based on the assumption that psychological symptoms are caused and maintained by interpersonal problems (Gunlicks-Stoessel & Weissman, 2011).

Interpersonal therapy may be brief or long-term, but it is highly structured (Blanco & others, 2006; Teyber, 2009). In the first phase of treatment, the therapist identifies the interpersonal problem that is causing difficulties. In the interpersonal therapy model, there are four categories of personal problems: unresolved grief, role disputes, role transitions, and interpersonal deficits. *Unresolved grief* refers to problems dealing with the death of significant others, while *role disputes* refer to repetitive conflicts with significant others, such as the person's partner, family members, friends, or co-workers. *Role transitions* include problems involving major life changes, such as going away to college, becoming a parent, getting married or divorced, or retiring. *Interpersonal deficits* refer to absent or faulty social skills that limit the ability to start or maintain healthy relationships with others (Mallinckrodt, 2001). During treatment, the therapist helps the person understand his particular interpersonal problem and develop strategies to resolve it.

IPT is used to treat eating disorders and substance abuse as well as depression. It is also effective in helping people deal with interpersonal problems, such as marital conflict, parenting issues, and conflicts at work (Bleiberg & Markowitz, 2008). In one innovative application, IPT was successfully used to treat symptoms of depression in villagers in Uganda, demonstrating its effectiveness in a non-Western culture (Bolton & others, 2003). Beyond individual psychotherapy, IPT has proved to be valuable in family and group therapy sessions (Woody, 2008; Zimmerman, 2008).

If Sigmund Freud were alive today, would he be upset by these departures from traditional psychoanalysis? Not at all. In fact, Freud himself treated some of his patients using short-term psychodynamic therapy that sometimes lasted for only one lengthy session. Several of Freud's patients completed psychoanalysis in as little as two months (Magnavita, 1993).

Even though traditional, lengthy psychoanalysis is uncommon today, Freud's basic assumptions and techniques continue to be influential. Contemporary research has challenged many of Freud's original ideas. However, modern researchers continue to study the specific factors that seem to influence the effectiveness of basic Freudian techniques, such as dream analysis, interpretation, transference, and the role of insight in reducing psychological symptoms (Glucksman & Kramer, 2004; Luborsky & Barrett, 2006).

short-term dynamic therapies Type of psychotherapy that is based on psychoanalytic theory but differs in that it is typically time-limited, has specific goals, and involves an active, rather than neutral, role for the therapist.

interpersonal therapy (IPT) A brief, psychodynamic psychotherapy that focuses on current relationships and is based on the assumption that symptoms are caused and maintained by interpersonal problems.

client-centered therapy A type of psychotherapy developed by humanistic psychologist Carl Rogers in which the therapist is nondirective and reflective, and the client directs the focus of each therapy session; also called *person-centered therapy.*

Humanistic Therapy

KEY THEME

› The most influential humanistic psychotherapy is client-centered therapy, which was developed by Carl Rogers.

KEY QUESTIONS

› What are the key assumptions of humanistic therapy, including client-centered therapy?

› What therapeutic techniques and conditions are important in client-centered therapy?

› How do client-centered therapy and psychoanalysis differ?

The *humanistic perspective* in psychology emphasizes human potential, self-awareness, and freedom of choice (see Chapter 11). Humanistic psychologists contend that the most important factor in personality is the individual's conscious, subjective perception of his or her self. They see people as being innately good and motivated by the need to grow psychologically. If people are raised in a genuinely accepting atmosphere and given freedom to make choices, they will develop healthy self-concepts and strive to fulfill their unique potential as human beings (Kirschenbaum & Jourdan, 2005; Pos & others, 2008).



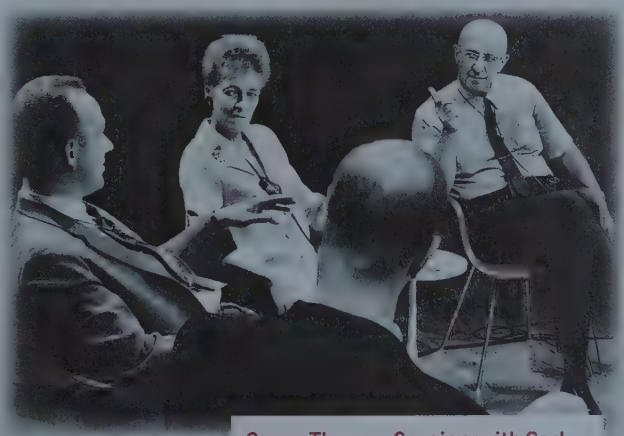
Carl Rogers (1902–1987) In his classic text, *On Becoming a Person*, Rogers (1961) described how his own thinking changed as he developed client-centered therapy. He wrote, "In my early professional years, I was asking the question: How can I treat, or cure, or change this person? Now I would phrase the question in this way: How can I provide a relationship which this person may use for his own personal growth?"

Roger Ressmeyer/Corbis

Carl Rogers and Client-Centered Therapy

The humanistic perspective has exerted a strong influence on psychotherapy (Cain 2002, 2003; Schneider & Krug, 2009). Probably the most influential of the humanistic psychotherapies is **client-centered therapy,** also called *person-centered therapy,* developed by **Carl Rogers.** In naming his therapy, Rogers (1951) deliberately used the word *client* rather than *patient.* He believed that the medical term *patient* implied that people in therapy were "sick" and were seeking treatment from an all-knowing authority figure who could "heal" or "cure" them. Instead of stressing the therapist's expertise or perceptions of the patient, client-centered therapy emphasizes the *client's* subjective perception of himself and his environment (Cain, 2002; Raskin & Rogers, 2005).

Like Freud, Rogers saw the therapeutic relationship as the catalyst that leads to insight and lasting personality change. But Rogers viewed the nature of this relationship very differently from Freud. According to Rogers (1977), the therapist should not exert power by offering carefully timed "interpretations" of the patient's unconscious conflicts. Advocating just the opposite, Rogers believed that the therapist should be *nondirective.* That is, the therapist must not direct the client, make decisions for the client, offer solutions, or pass judgment on the client's thoughts or feelings. Instead, Rogers believed, change in therapy must be chosen and directed by the client (Bozarth & others, 2002). The therapist's role is to create the conditions that allow the client, not the therapist, to direct the focus of therapy.



Michael Rougier, LIFE Magazine Inc.

Group Therapy Session with Carl Rogers Rogers filmed many of his therapy sessions as part of an ongoing research program to identify the most helpful aspects of client-centered therapy. Shown on the far right, Rogers contended that human potential would flourish in an atmosphere of genuineness, unconditional positive regard, and empathic understanding.

What are the therapeutic conditions that promote self-awareness, psychological growth, and self-directed change? Rogers (1957c, 1980) believed that three qualities of the therapist are necessary: *genuineness, unconditional positive regard,* and *empathic understanding.* First, *genuineness* means that the therapist honestly and openly shares her thoughts and feelings with the client. By modeling genuineness, the therapist indirectly encourages the client to exercise this capability more fully in himself.



David Buffington/Getty Images

Client-Centered Therapy The client-centered therapist strives to create a warm, accepting climate that allows the client the freedom to explore troubling issues. The therapist engages in active listening, reflecting both the content and the personal meaning of what the client is saying. In doing so, the therapist helps the client develop a clearer perception and understanding of her own feelings and motives.

An empathic way of being with another person has several facets. It means entering the private perceptual world of the other and becoming thoroughly at home in it. It involves being sensitive, moment by moment, to the changing felt meanings which flow in this other person, to the fear or rage or tenderness or confusion or whatever that he or she is experiencing.

—Carl Rogers (1980)

Second, the therapist must value, accept, and care for the client, whatever her problems or behavior. Rogers called this quality *unconditional positive regard* (Bozarth & Wang, 2008). Rogers believed that people develop psychological problems largely because they have consistently experienced only *conditional acceptance*. That is, parents, teachers, and others have communicated this message to the client: "I will accept you only *if* you conform to my expectations." Because acceptance by significant others has been conditional, the person has cut off or denied unacceptable aspects of herself, distorting her self-concept. In turn, these distorted perceptions affect her thoughts and behaviors in unhealthy, unproductive ways.

The therapist who successfully creates a climate of unconditional positive regard fosters the person's natural tendency to move toward self-fulfilling decisions without fear of evaluation or rejection. Rogers (1977) described this important aspect of therapy in this way:

> Unconditional positive regard means that when the therapist is experiencing a positive, acceptant attitude toward whatever the client *is* at that moment, therapeutic movement or change is more likely. It involves the therapist's willingness for the client to be whatever feeling is going on at that moment—confusion, resentment, fear, anger, courage, love, or pride. . . . The therapist prizes the client in a total rather than a conditional way.

Third, the therapist must communicate *empathic understanding* by reflecting the content and personal meaning of the feelings being experienced by the client. In effect, the therapist creates a psychological mirror, reflecting the client's thoughts and feelings as they exist in the client's private inner world. The goal is to help the client explore and clarify his feelings, thoughts, and perceptions. In the process, the client begins to see himself, and his problems, more clearly (Freire, 2007).

Empathic understanding requires the therapist to listen *actively* for the personal meaning beneath the surface of what the client is saying (Watson, 2002). Rogers believed that when the therapeutic atmosphere contains genuineness, unconditional positive regard, and empathic understanding, change is more likely to occur. Such conditions foster feelings of being psychologically safe, accepted, and valued. In this therapeutic atmosphere, change occurs as the person's self-concept and worldview gradually become healthier and less distorted. According to Rogers (1977), "As the client becomes more self-aware, more self-acceptant, less defensive and more open, she finds at last some of the freedom to grow and change in directions natural to the human organism." In effect, the client is moving in the direction of *self-actualization*—the realization of his or her unique potentials and talents.

A large number of studies have generally supported the importance of genuineness, unconditional positive regard, and empathic understanding (Elliott & others, 2004; Greene, 2008). Such factors promote trust and self-exploration in therapy. However, these conditions, by themselves, may not be sufficient to help clients change (Cain & Seeman, 2002; Sachse & Elliott, 2002).

Motivational Interviewing: Helping Clients Commit to Change

Like psychoanalysis, client-centered therapy has evolved and adapted to changing times. It continues to have a powerful impact on therapists, teachers, social workers, and counselors (see Cooper & others, 2007). Of particular note has been the development of

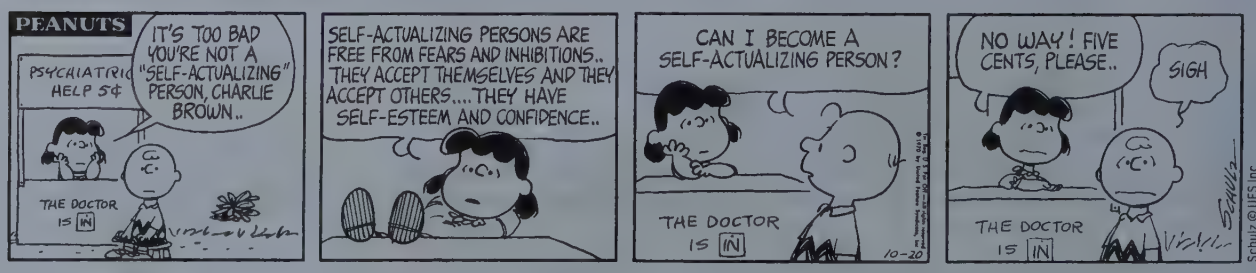


TABLE 15.2

Comparing Psychodynamic and Humanistic Therapies

Type of Therapy	Founder	Source of Problems	Treatment Techniques	Goals of Therapy
Psychoanalysis	Sigmund Freud	Repressed, unconscious conflicts stemming from early childhood experiences	Free association, analysis of dream content, interpretation, and transference	To recognize, work through, and resolve long-standing conflicts
Client-centered therapy	Carl Rogers	Conditional acceptance that causes the person to develop a distorted self-concept and worldview	Nondirective therapist who displays unconditional positive regard, genuineness, and empathic understanding	To develop self-awareness, self-acceptance, and self-determination

motivational interviewing (Miller & Rollnick, 2002). *Motivational interviewing (MI)* is designed to help clients overcome the mixed feelings or reluctance they might have about committing to change. Usually lasting only a session or two, MI is more directive than traditional client-centered therapy (Arkowitz & others, 2007; Hettema & others, 2005).

The main goal of MI is to encourage and strengthen the client's self-motivating statements or "change talk" (Hayes & others, 2011). These are expressions of the client's need, desire, and reasons for change. Using client-centered techniques, the therapist responds with empathic understanding and reflective listening, helping the client explore his or her own values and motivations for change. When the client expresses reluctance, the therapist acknowledges the mixed feelings and redirects the emphasis toward change (Miller & Rose, 2009). As Jennifer Hettema and her colleagues (2005) explain:

> The counselor seeks to evoke the client's own motivation, with confidence in the human desire and capacity to grow in positive directions. Instead of implying that "I have what you need," MI communicates, "You have what you need." In this way, MI falls squarely within the humanistic "third force" in the history of psychotherapy.

Along with being influential in individual psychotherapy, the client-centered approach has been applied to marital counseling, parenting, education, business, and even community and international relations (Henderson & others, 2007). Table 15.2 compares some aspects of psychoanalysis and client-centered therapy.

Behavior Therapy

KEY THEME

› Behavior therapy uses learning principles to directly change problem behaviors.

KEY QUESTIONS

› What are the key assumptions of behavior therapy?

› What therapeutic techniques are based on classical conditioning, and how are they used to treat psychological disorders and problems?

› What therapy treatments are based on operant conditioning, and how are they used to treat psychological disorders and problems?

Psychoanalysis, client-centered therapy, and other insight-oriented therapies maintain that the road to psychologically healthier behavior is through increased self-understanding of motives and conflicts. As insights are acquired through therapy, problem behaviors and feelings presumably will give way to more adaptive behaviors and emotional reactions.

However, gaining insight into the source of problems does not necessarily result in desirable changes in behavior and emotions. Even though you fully understand *why* you are behaving in counterproductive ways, your maladaptive or self-defeating behaviors may continue. For instance, an adult who is extremely anxious about public



A.J. Photo/Photo Researchers

Behavior Therapy—From Bad Habits to Severe Psychological Disorders
Nail biting and cigarette smoking are examples of the kinds of everyday maladaptive behaviors that can be successfully treated with behavior therapy. Behavioral techniques can also be used to treat more severe psychological problems, such as phobias, and to improve functioning in people with severe mental disorders such as schizophrenia and autism.

speaking may understand that he feels that way because he was raised by a critical and demanding parent. But having this insight into the underlying cause of his anxiety may do little, if anything, to reduce his anxiety or change his avoidance of public speaking.

In sharp contrast to the insight-oriented therapies we discussed in the preceding sections, the goal of **behavior therapy,** also called *behavior modification,* is to modify specific problem behaviors, not to change the entire personality. And, rather than focusing on the past, behavior therapists focus on current behaviors.

Behavior therapists assume that maladaptive behaviors are *learned,* just as adaptive behaviors are. Thus, the basic strategy in behavior therapy involves unlearning maladaptive behaviors and learning more adaptive behaviors in their place. Behavior therapists employ techniques that are based on the learning principles of classical conditioning, operant conditioning, and observational learning to modify the problem behavior.

Techniques Based on Classical Conditioning

Just as Pavlov's dogs learned to salivate to a ringing bell that had become associated with food, learned associations can be at the core of some maladaptive behaviors, including strong negative emotional reactions. In the 1920s, psychologist John Watson demonstrated this phenomenon with his famous "Little Albert" study. In Chapter 5, we described how Watson classically conditioned an infant known as Little Albert to fear a tame lab rat by repeatedly pairing the rat with a loud clanging sound. Over time, Albert's conditioned fear generalized to other furry objects, including a fur coat, cotton, and a Santa Claus mask (Watson & Rayner, 1920).

Mary Cover Jones

The First Behavior Therapist

Watson himself never tried to eliminate Little Albert's fears. But Watson's research inspired one of his students, **Mary Cover Jones,** to explore ways of reversing conditioned fears. With Watson acting as a consultant, Jones (1924a) treated a 3-year-old named Peter who "seemed almost to be Albert grown a bit older." Like Little Albert, Peter was fearful of various furry objects, including a tame rat, a fur coat, cotton, and wool. Because Peter was especially afraid of a tame rabbit, Jones focused on eliminating the rabbit fear. She used a procedure that has come to be known as **counterconditioning**—the learning of a new conditioned response that is incompatible with a previously learned response.

Jones's procedure was very simple (Jones, 1924b; Watson, 1924). The caged rabbit was brought into Peter's view but kept far enough away to avoid eliciting fear (the original conditioned response). With the rabbit visible at a tolerable distance, Peter sat in a high chair and happily munched his favorite snack, milk and crackers. Peter's favorite food was used because, presumably, the enjoyment of eating would naturally elicit a positive response (the desired conditioned response). Such a positive response would be incompatible with the negative response of fear.

Every day for almost two months, the rabbit was inched closer and closer to Peter as he ate his milk and crackers. As Peter's tolerance for the rabbit's presence gradually increased, he was eventually able to hold the rabbit in his lap, petting it with one hand while happily eating with his other hand (Jones, 1924a, 1924b). Not only was Peter's fear of the rabbit eliminated, but he also stopped being afraid of other furry objects, including the rat, cotton, and the fur coat (Watson, 1924).

Along with counterconditioning, Jones (1924a) used social imitation, or *observational learning,* techniques to help eliminate Peter's fear of rabbits (Kornfeld, 1989). As part of the treatment, Peter observed other children petting or holding the tame rabbit. Eventually, Peter imitated the actions of the nonfearful children. For her pioneering efforts in the treatment of children's fears, Jones is widely regarded as the first behavior therapist (Gieser, 1993; Rutherford, 2006).



Larson/Watson Papers, Archives of the History of American Psychology, The University of Akron

Mary Cover Jones (1896–1987)
This photograph, taken around 1919, shows Mary Cover Jones as a college student in her early 20s. Although Jones pioneered the use of behavioral techniques in therapy, she did not consider herself a "behaviorist" and ultimately came to disagree with many of Watson's views. Fifty years after she treated Peter, Jones (1975) wrote, "Now I would be less satisfied to treat the fears of a three-year-old . . . in isolation from him as a tantalizingly complex person with unique potentials for stability and change."

Systematic Desensitization

Mary Cover Jones's pioneering studies in treating children's fears laid the groundwork for the later development of a more standardized procedure to treat phobias and other anxiety disorders. Developed by South African psychiatrist Joseph Wolpe in the 1950s, the procedure is called *systematic desensitization* (Wolpe, 1958, 1982). Based on the same premise as counterconditioning, **systematic desensitization** involves learning a new conditioned response (relaxation) that is incompatible with or inhibits the old conditioned response (fear and anxiety).

Three basic steps are involved in systematic desensitization. First, the patient learns *progressive relaxation,* which involves successively relaxing one muscle group after another until a deep state of relaxation is achieved. Second, the behavior therapist helps the patient construct an *anxiety hierarchy,* which is a list of anxiety-provoking images associated with the feared situation, arranged in a hierarchy from least to most anxiety-producing (see Figure 15.1). The patient also develops an image of a relaxing *control scene,* such as walking on a secluded beach on a sunny day.

The third step involves the actual process of desensitization. While deeply relaxed, the patient imagines the least threatening scene on the anxiety hierarchy. After he can maintain complete relaxation while imagining this scene, he moves to the next. If the patient begins to feel anxiety or tension, the behavior therapist guides him back to imagining the previous scene or the control scene. If necessary, the therapist helps the patient relax again, using the progressive relaxation technique.

Over several sessions, the patient gradually and systematically works his way up the hierarchy, imagining each scene while maintaining complete relaxation. Very systematically, each imagined scene becomes paired with a conditioned response of relaxation rather than anxiety, and desensitization to the feared situation takes place. Once mastered with mental images, the desensitization procedure may be continued in the actual feared situation. If the technique is successful, the feared situation no longer produces a conditioned response of fear and anxiety. In practice, systematic desensitization is often combined with other techniques, such as *observational learning* (Bandura, 2004b).

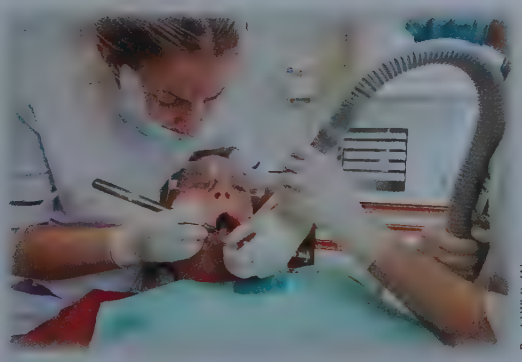
Let's consider a clinical example that combines systematic desensitization and observational learning. The client is Michael, a 60-year-old man afraid of flying on airplanes. To overcome this phobia, he's seeing a behavior therapist. The therapist first teaches Michael progressive relaxation so he can induce relaxation in himself. Then, she and Michael move through the anxiety hierarchy they had created. In Michael's case, the hierarchy starts with imagining airplanes flying above high in the sky, then moves on to viewing pictures of airplanes at a distance, then viewing the interior of

behavior therapy A type of psychotherapy that focuses on directly changing maladaptive behavior patterns by using basic learning principles and techniques; also called *behavior modification.*

counterconditioning A behavior therapy technique based on classical conditioning that involves modifying behavior by conditioning a new response that is incompatible with a previously learned response.

systematic desensitization A type of behavior therapy in which phobic responses are reduced by pairing relaxation with a series of mental images or real-life situations that the person finds progressively more fear-provoking; based on the principle of counterconditioning.

Degree of Fear	Imagined Scene
100	Holding mouth open, eyes closed, listening to the sound of the dental drill as a cavity is repaired
95	Holding mouth open in preparation for an oral injection
90	Lying back in dental chair, eyes closed, as dentist examines teeth
85	Lying back in dental chair, mouth open, listening to the sounds of dental equipment as dental technician cleans teeth
80	Lying in dental chair, watching dental technician unwrap sterilized dental tools
75	Being greeted by the dental technician and walking back to dental examination chair
70	Sitting in dentist's waiting room
60	Driving to dentist's office for appointment
50	Looking at the bright yellow reminder postcard on the refrigerator and thinking about dental appointment
40	Listening to a family member talk about her last dental visit
30	Looking at television or magazine advertisements depicting people in a dentist's chair
25	Calling dentist's office to make an appointment
20	Thinking about calling dentist's office to set up an appointment
15	Driving past dentist's office on a workday
10	Driving past dentist's office on a Sunday afternoon



David White/Alamy

FIGURE 15.1 A Sample Anxiety Hierarchy Used in Systematic Desensitization As part of systematic desensitization, the therapist helps the client develop an anxiety hierarchy. The sample anxiety hierarchy shown here illustrates the kinds of scenes that might be listed by a person who is phobic of dental treatment (Getka & Glass, 1992). Starting at the bottom of the hierarchy, relaxation is paired with each scene until the client can calmly visualize the image. Only then does he move to the next scene in the hierarchy.

airplanes, and ultimately actually boarding an airplane and taking a flight. There were other, smaller steps in the hierarchy as well, to make sure Michael could progress from step to step without too much of a "jump."

Michael is able to move through the hierarchy by experiencing relaxation in conjunction with each consecutive stimulus that might have produced anxiety. Because relaxation and anxiety are incompatible, the relaxation essentially "blocks" Michael's anxiety about flying, just as Peter's enjoyment of his milk and cookies blocked his anxiety about the rabbit. Another important aspect of the behavior therapist's treatment of Michael involves observational learning: She shows Michael videos of people calmly boarding and riding on planes. Together, systematic desensitization and observational learning help Michael overcome his phobia, and he is ultimately able to fly with minimal discomfort.

The In Focus box, "Using Virtual Reality to Conquer Phobias," describes the use of computer technology to treat phobias and other anxiety disorders.

IN FOCUS

Using Virtual Reality to Conquer Phobias

Virtual reality (VR) therapy consists of computer-generated scenes that you view wearing goggles and a special motion-sensitive headset. Move your head in any direction and an electromagnetic sensor in the helmet detects the movement, and the computer-generated scene you see changes accordingly. Turning a handgrip lets you move forward or backward to explore your artificial world. You can also use a virtual hand to reach out and touch objects, such as an elevator button or a spider.

VR technology was first used in the treatment of specific phobias, including fear of flying, heights, spiders, driving, and enclosed places (Côté & Bouchard, 2008). In the virtual reality scene, patients are progressively exposed to the feared object or situation. For example, psychologist Ralph Lamson used virtual reality as a form of computer-assisted systematic desensitization to help more than 60 patients conquer their fear of heights. Rather than mental images, the person experiences computer-generated images that seem almost real. Once the helmet is donned, patients begin a 40-minute journey that starts in a café and progresses to a narrow wooden plank that leads to a bridge.

Although computer-generated and cartoonlike, the scenes of being high above the ground on the plank or bridge are real enough to trigger the physiological indicators of anxiety. Lamson encourages the person to stay in the same spot until the anxiety diminishes. Once relaxed, the person continues the VR journey. By the time the person makes the return journey back over the plank, heart rate and blood pressure are close to normal. After virtual reality therapy, over 90 percent of Lamson's patients successfully rode a glass elevator up to the 15th floor.

Once experimental, virtual reality therapy has become an accepted treatment for specific phobias and is now being extended to other anxiety disorders, such as social phobia, panic disorder, and acrophobia (Meyerbröker & Emmelkamp, 2010; Parsons & Rizzo, 2008; Powers & Emmelkamp, 2008). One innovative application of VR therapy is in the treatment of post-traumatic stress disorder (PTSD) in veterans of the wars in Vietnam, Iraq, and Afghanistan (McLay & others, 2011; Reger & Gahm, 2008). Many PTSD patients are unable or unwilling to mentally re-create the traumatic events that caused their disorder, but the vivid sensory details of the "virtual world" encourage the patient to relive the experience in a controlled fashion.

For example, a young woman who suffered from severe PTSD after witnessing and barely escaping the attack on the World Trade Center was finally able to relive the events of the day through controlled, graduated exposure to a virtual reenactment of the events. Similarly, war veterans can be exposed to the sights and sounds of combat in a way that could not be accomplished in the "real world" of a therapist's office or busy downtown street.

VR therapy is easier and less expensive to administer than graduated exposure to the actual feared object or situation. Another advantage is that the availability of VR may make people who are extremely phobic more willing to seek treatment. In one survey of people who were phobic of spiders, more than 80 percent preferred virtual reality treatment over graduated exposure to real spiders (Garcia-Palacios & others, 2001).



Photo by Stephen Dagadakis, copyright Hunter Hoffman, www.vrpain.com, University of Washington Seattle.

Virtual Reality Psychologist Hunter Hoffmann is shown here demonstrating the use of SpiderWorld, a three-dimensional virtual reality program that creates the very realistic sensation of seeing, and even touching, large spiders. Once experimental, virtual reality treatment has been shown to be effective in treating specific phobias and other anxiety disorders, including post-traumatic stress disorder in combat veterans and in victims of terrorist attacks (Freedman & others, 2010; Miyahira & others, 2010).

Aversive Conditioning

aversive conditioning A relatively ineffective type of behavior therapy that involves repeatedly pairing an aversive stimulus with the occurrence of undesirable behaviors or thoughts.

The psychologist John Garcia first demonstrated how taste aversions could be classically conditioned (see Chapter 5). After rats drank a sweet-flavored water, Garcia injected them with a drug that made them ill. The rats developed a strong taste aversion for the sweet-flavored water, avoiding it altogether (Garcia & others, 1966). In much the same way, **aversive conditioning** attempts to create an unpleasant conditioned response to a harmful stimulus, such as cigarette smoking or alcohol consumption. For substance abuse and addiction, taste aversions are commonly induced with the use of nausea-inducing drugs. For example, a medication called *Antabuse* is used in aversion therapy for alcoholism. Consuming alcohol while taking Anatabuse produces bouts of extreme, highly unpleasant nausea. Aversive conditioning techniques have been applied to a wide variety of problem behaviors (Cain & LeDoux, 2008). However, mental health professionals are typically very cautious about the use of such techniques, partly because of their potential to harm or produce discomfort for clients (Fisher, 2009; Francis, 2009). In addition, aversive techniques are generally not very effective (Emmelkamp, 2004).

Techniques Based on Operant Conditioning

B. F. Skinner's *operant conditioning* model of learning is based on the simple principle that behavior is shaped and maintained by its consequences (see Chapter 5). Behavior therapists have developed several treatment techniques that are derived from operant conditioning. *Shaping* involves reinforcing successive approximations of a desired behavior. Shaping is often used to teach appropriate behaviors to patients who are mentally disabled by autism, mental retardation, or severe mental illness. For example, shaping has been used to increase the attention span of hospitalized patients with severe schizophrenia (Combs & others, 2011; Silverstein & others, 2009).

Other operant conditioning techniques involve controlling the consequences that follow behaviors. *Positive* and *negative reinforcement* are used to increase the incidence of desired behaviors. *Extinction,* or the absence of reinforcement, is used to reduce the occurrence of undesired behaviors.

Let's illustrate how operant techniques are used in therapy by describing a behavioral program to treat 4-year-old girl's sleeping problems (Ronen, 1991). The first step in the treatment program was to identify specific problem behaviors and determine their *baseline rate,* or how often each problem occurred before treatment began (see Figure 15.2). After measuring the baseline rate, the therapist could target each problem behavior individually and objectively measure the child's progress. The parents next identified several very specific behavioral goals for their daughter. These goals included not crying when she was put to bed, not crying if she woke up in the night, not getting into her parents' bed, and staying in her own bed throughout the night.

The parents were taught operant techniques to decrease the undesirable behaviors and increase desirable ones. For example, to *extinguish* the girl's screaming and crying, the parents were taught to ignore the behavior rather than continue to reinforce it with parental attention. In contrast, desirable behaviors were to be *positively reinforced* with abundant praise, encouragement, social attention, and other rewards. Figure 15.2 shows the little girl's progress for three specific problem behaviors.

Operant conditioning techniques have been applied to many different kinds of psychological problems, from

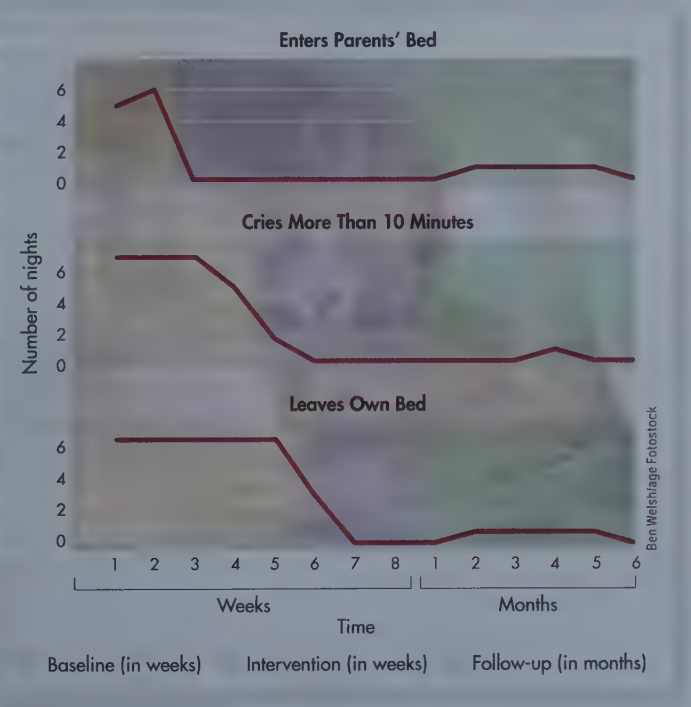


FIGURE 15.2 The Effect of Operant Conditioning Techniques These graphs depict the changes in three specific sleep-related problem behaviors of a 4-year-old girl over the course of behavioral therapy. The intervention for each problem behavior was introduced separately over several weeks. As you can see, behavior therapy produced a rapid reduction in the rate of each problem behavior. The green area shows the maintenance of desired behavior changes over a six-month follow-up.

Source: Adapted from Ronen (1991).

TABLE 15.3

Behavior Therapy

Type of Therapy	Founder	Source of Problems	Treatment Techniques	Goals of Therapy
Behavior therapy	Based on classical conditioning, operant conditioning, and observational learning	Learned maladaptive behavior patterns	Systematic desensitization, virtual reality, aversive conditioning, reinforcement and extinction, token economy, contingency management interventions, observational learning	To unlearn maladaptive behaviors and replace them with adaptive, appropriate behaviors

habit and weight control to helping autistic children learn to speak and behave more adaptively. Techniques based on operant conditioning have also been successfully used to modify the behavior of people who are severely disabled by retardation or mental disorders (see Zinbarg & Griffith, 2008).

The **token economy** is another example of the use of operant conditioning techniques to modify behavior. A token economy is a system for strengthening desired behaviors through positive reinforcement in a very structured environment. Basically, tokens or points are awarded as positive reinforcers for desirable behaviors and withheld or taken away for undesirable behaviors. The tokens can be exchanged for other reinforcers, such as special privileges.

Token economies have been most successful in controlled environments in which the behavior of the client is under ongoing surveillance or supervision. Thus, token economies have been used in prisons, classrooms, inpatient psychiatric units, and juvenile correction institutions (Ringdahl & Falcomata, 2009; Field & others, 2004). They have been shown to be effective even with severely disturbed patients who have been hospitalized for many years (Paul & Menditto, 1992). Although effective, token economies are difficult to implement, especially in community-based outpatient clinics, so they are not in wide use today (Lieberman, 2000).

A modified version of the token economy has been used with outpatients in treatment programs called *contingency management*. Like the token economy, a contingency management intervention involves carefully specified behaviors that "earn" the individual concrete rewards. Unlike token economies, which cover many behaviors, contingency management strategies are typically more narrowly focused on one or a small number of specific behaviors (Prochaska & Norcross, 2010). Contingency management interventions have proved to be especially effective in the outpatient treatment of people who are dependent on heroin, cocaine, alcohol, or multiple drugs (Higgins & others, 2011; Tuten & others, 2012).

Table 15.3 summarizes key points about behavior therapy.



Cognitive Therapies

KEY THEME

› Cognitive therapies are based on the assumption that psychological problems are due to maladaptive thinking.

KEY QUESTIONS

› What are rational-emotive therapy and cognitive therapy, and how do they differ?

› What is cognitive-behavioral therapy?

token economy A form of behavior therapy in which the therapeutic environment is structured to reward desired behaviors with tokens or points that may eventually be exchanged for tangible rewards.

cognitive therapies A group of psychotherapies based on the assumption that psychological problems are due to illogical patterns of thinking; treatment techniques focus on recognizing and altering these unhealthy thinking patterns.

rational-emotive therapy (RET) A type of cognitive therapy, developed by psychologist Albert Ellis, that focuses on changing the client's irrational beliefs.

While behavior therapy assumes that faulty learning is at the core of problem behaviors and emotions, the **cognitive therapies** assume that the culprit is *faulty thinking*. The key assumption of the cognitive therapies could be put like this: Most people blame their unhappiness and problems on external events and situations, but the real cause of unhappiness is the way the person *thinks* about the events, not the events themselves. Thus, cognitive therapists zero in on the faulty, irrational patterns of thinking that they believe are causing the psychological problems. Once faulty, irrational patterns of thinking have been identified, the next step is to *change* them to more adaptive, healthy

patterns of thinking. In this section, we'll look at how this change is accomplished in two influential forms of cognitive therapy: Ellis's *rational-emotive therapy* (RET) and Beck's *cognitive therapy* (CT).

Albert Ellis and Rational-Emotive Therapy

Shakespeare said it more eloquently, but psychologist **Albert Ellis** has expressed the same sentiment: "You largely feel the way you think." Ellis was trained as both a clinical psychologist and a psychoanalyst. As a practicing psychoanalyst, Ellis became increasingly disappointed with the psychoanalytic approach to solving human problems. Psychoanalysis simply didn't seem to work: His patients would have insight after insight, yet never get any better.

> There is nothing either good or bad, but thinking makes it so.
>
> —*William Shakespeare*, Hamlet

In the 1950s, Ellis began to take a more active, directive role in his therapy sessions. He developed **rational-emotive therapy,** abbreviated **RET.** RET is based on the assumption that "people are not disturbed by things but rather by their view of things" (Ellis, 1991; Ellis & Ellis, 2011). The key premise of RET is that people's difficulties are caused by their faulty expectations and irrational beliefs. Rational-emotive therapy focuses on changing the patterns of irrational thinking that are believed to be the primary cause of the client's emotional distress and psychological problems.

Ellis points out that most people mistakenly believe that they become upset and unhappy because of external events. But Ellis (1993; Ellis & Ellis, 2011) would argue that it's not external events that make people miserable—it's their *interpretation* of those events. It's not David's behavior that's really making Carrie miserable—it's Carrie's *interpretation* of the meaning of David's behavior. In rational-emotive therapy, psychological problems are explained by the "ABC" model, as shown in Figure 15.3. According to this model, when an *Activating event* (**A**) occurs, it is the person's *Beliefs* (**B**) about the event that cause emotional *Consequences* (**C**).



Albert Ellis (1913–2007) A colorful and sometimes controversial figure, Albert Ellis developed rational-emotive therapy (RET). Rational-emotive therapy promotes psychologically healthier thought processes by disputing irrational beliefs and replacing them with more rational interpretations of events.

Photo courtesy of Albert Ellis Institute

Identifying the core irrational beliefs that underlie personal distress is the first step in rational-emotive therapy. Often, irrational beliefs reflect "musts" and "shoulds" that are absolutes, such as the notion that "I should be competent at everything I do." Other common irrational beliefs are listed in Table 15.4 on the next page.

The consequences of such thinking are unhealthy negative emotions, like extreme anger, despair, resentment, and feelings of worthlessness. Not only does the person feel miserable, but she also feels that she is unable to cope with or control an upsetting situation. These kinds of irrational cognitive and emotional responses interfere with constructive attempts to change disturbing situations (Ellis & Ellis, 2011; O'Donohue & Fisher, 2009). According to RET, the result is self-defeating behaviors, anxiety disorders, depression, and other psychological problems.

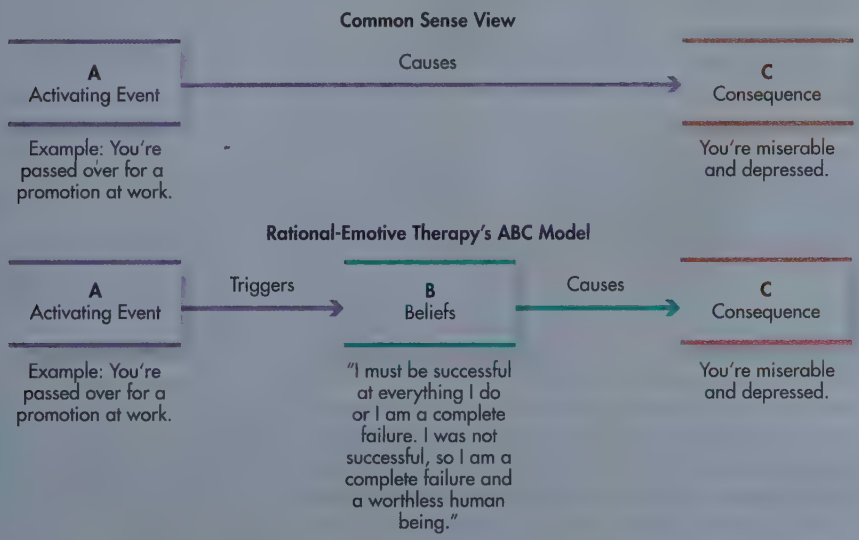


FIGURE 15.3 The "ABC" Model in Rational-Emotive Therapy Common sense tells us that unhappiness and other unpleasant emotions are caused by unpleasant or disturbing events. This view is shown in the top part of the figure. But Albert Ellis (1993) points out that it is really our *beliefs* about the events, not the events themselves, that make us miserable, as diagrammed in the bottom part of the figure.

TABLE 15.4

Irrational Beliefs

1. It is a dire necessity for you to be loved or approved of by virtually everyone in your community.
2. You must be thoroughly competent, adequate, and achieving in all possible respects if you are to consider yourself worthwhile.
3. Certain people are bad, wicked, or villainous, and they should be severely blamed and punished for their villainy. You should become extremely upset over other people's wrongdoings.
4. It is awful and catastrophic when things are not the way you would very much like them to be.
5. Human unhappiness is externally caused, and you have little or no ability to control your bad feelings and emotions.
6. It is easier to avoid than to face difficulties and responsibilities. Avoiding difficulties whenever possible is more likely to lead to happiness than facing difficulties.
7. You need to rely on someone stronger than yourself.
8. Your past history is an all-important determinant of your present behavior. Because something once strongly affected your life, it should indefinitely have a similar effect.
9. You should become extremely upset over other people's problems.
10. There is a single perfect solution to all human problems, and it is catastrophic if this perfect solution is not found.

Source: Based on Ellis (1991).

According to rational-emotive therapy, unhappiness and psychological problems can often be traced to people's irrational beliefs. Becoming aware of these irrational beliefs is the first step toward replacing them with more rational alternatives. Some of the most common irrational beliefs are listed here.



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"Look, making you happy is out of the question, but I can give you a compelling narrative for your misery."

The next step in rational-emotive therapy is for the therapist to vigorously *dispute the irrational beliefs.* In doing so, rational-emotive therapists tend to be very direct and even confrontational (Ellis & others, 2009; Ellis & Ellis, 2011). Rather than trying to establish a warm, supportive atmosphere, rational-emotive therapists rely on logical persuasion and reason to push the client toward recognizing and surrendering his irrational beliefs (Dryden, 2008). According to Ellis (1991), blunt, harsh language is sometimes needed to push people into helping themselves.

From the client's perspective, rational-emotive therapy requires considerable effort. First, the person must admit her irrational beliefs and accept the fact that those beliefs are irrational and unhealthy, which is not as easy as it sounds. Old mental habits don't always yield easily. Equally challenging, the client must radically change her way of interpreting and responding to stressful events (Dobson & Dobson, 2009; Haaga & Davison, 1991).

The long-term therapeutic goal of RET is to teach clients to recognize and dispute their own irrational beliefs in a wide range of situations. However, responding "rationally" to unpleasant situations does not mean denying your feelings (Dryden 2009, Ellis & Bernard, 1985). Ellis believes that it is perfectly appropriate and rational to feel sad when you are rejected or regretful when you make a mistake. Appropriate emotions are the consequences of rational beliefs, such as "I would prefer that everyone like me, but that's not likely to happen" or "It would be nice if I never failed at anything, but it's unlikely that I will always succeed in everything I do." Such healthy mental and emotional responses encourage people to work toward constructively changing or coping with difficult situations (Dryden & Branch, 2008; Ellis & Harper, 1975).

Albert Ellis was a colorful figure whose ideas have been extremely influential in psychotherapy (DeAngelis, 2007). Rational-emotive therapy is a popular approach in clinical practice, partly because it is straightforward and simple. It has been shown to be generally effective in the treatment of depression, social phobia, and certain anxiety disorders. Rational-emotive therapy is also useful in helping people overcome self-defeating behaviors, such as an excessive need for approval, extreme shyness, and chronic procrastination (Butler & others, 2006; David & others, 2009).

cognitive therapy (CT) Therapy developed by Aaron T. Beck that focuses on changing the client's unrealistic and maladaptive beliefs.

Aaron Beck and Cognitive Therapy

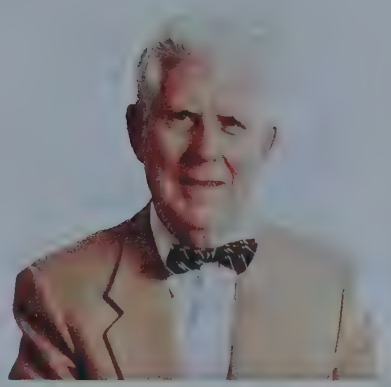
Like Albert Ellis, psychiatrist **Aaron T. Beck** was initially trained as a psychoanalyst. Beck's development of **cognitive therapy,** abbreviated **CT,** grew out of his research on depression (Beck, 2004; Beck & others, 1979). Seeking to scientifically validate the psychoanalytic assumption that depressed patients "have a need to suffer," Beck began collecting data on the free associations and dreams of his depressed patients. What he found, however, was that his depressed patients did *not* have a need to suffer. In fact, his depressed patients often went to great lengths to avoid being hurt or rejected by others.

Instead, Beck discovered that depressed people have an extremely negative view of the past, present, and future (Beck & others, 1979). Rather than realistically evaluating their situation, depressed patients have developed a *negative cognitive bias,* consistently distorting their experiences in a negative way. Their negative perceptions of events and situations are shaped by deep-seated, self-deprecating beliefs, such as "I can't do anything right," "I'm worthless," or "I'm unlovable" (Beck, 1991). Beck's cognitive therapy essentially focuses on correcting the cognitive biases that underlie depression and other psychological disorders (see Table 15.5).

Beck's CT has much in common with Ellis's rational-emotive therapy. Like Ellis, Beck believes that what people think creates their moods and emotions. And like RET, CT involves helping clients identify faulty thinking and replace unhealthy patterns of thinking with healthier ones.

But in contrast with Ellis's emphasis on "irrational" thinking, Beck believes that depression and other psychological problems are caused by *distorted thinking* and *unrealistic beliefs* (Hollon & Beck, 2004; Wright & others, 2011). Rather than logically debating the "irrationality" of a client's beliefs, the CT therapist encourages the client to *empirically test the accuracy of his or her assumptions and beliefs* (Hollon & Beck, 2004; Wills, 2009). Let's look at how this occurs in Beck's CT.

The first step in CT is to help the client learn to recognize and monitor the automatic thoughts that occur without conscious effort or control. Whether negative or positive,



Aaron T. Beck (b. 1921) In Aaron Beck's cognitive therapy, clients learn to identify and change their automatic negative thoughts. Originally developed to treat depression, cognitive therapy has also been applied to other psychological problems, such as anxiety disorders, phobias, and eating disorders.

Photo courtesy of Beck Institute for Cognitive Therapy and Research

TABLE 15.5

Cognitive Biases in Depression

Cognitive Bias (Error)	Description	Example
Arbitrary inference	Drawing a negative conclusion when there is little or no evidence to support it.	When Joan calls Jim to cancel their lunch date because she has an important meeting at work, Jim concludes that she is probably going out to lunch with another man.
Selective abstraction	Focusing on a single negative detail taken out of context, ignoring the more important aspects of the situation.	During Lisa's annual review, her manager praises her job performance but notes that she could be a little more confident when she deals with customers over the phone. Lisa leaves her manager's office thinking that he is on the verge of firing her because of her poor telephone skills.
Overgeneralization	Drawing a sweeping, global conclusion based on an isolated incident and applying that conclusion to other unrelated areas of life.	Tony spills coffee on his final exam. He apologizes to his instructor but can't stop thinking about the incident. He concludes that he is a klutz who will never be able to succeed in a professional career.
Magnification and minimization	Grossly overestimating the impact of negative events and grossly underestimating the impact of positive events so that small, bad events are magnified, but good, large events are minimized.	One week after Emily aces all her midterms, she worries about flunking out of college when she gets a B on an in-class quiz.
Personalization	Taking responsibility, blaming oneself, or applying external events to oneself when there is no basis or evidence for making the connection.	Richard becomes extremely upset when his instructor warns the class about plagiarism. He thinks the instructor's warning was aimed at him, and he concludes that the instructor suspects him of plagiarizing parts of his term paper.

Source: Based on Beck & others (1979), p. 14.

According to Aaron Beck, depressed people perceive and interpret experience in very negative terms. They are prone to systematic errors in logic, or cognitive biases, which shape their negative interpretation of events. The table shows the most common cognitive biases in depression.



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"You only think you're barking at nothing. We're all barking at something."

automatic thoughts can control your mood and shape your emotional and behavioral reactions to events (Ingram & others, 2007). Because their perceptions are shaped by their negative cognitive biases, depressed people usually have automatic thoughts that reflect very negative interpretations of experience. Not surprisingly, the result of such negative automatic thoughts is a deepened sense of depression, hopelessness, and helplessness.

In the second step of CT, the therapist helps the client learn how to *empirically test* the reality of the automatic thoughts that are so upsetting. For example, to test the belief that "I always say the wrong thing," the therapist might assign the person the task of initiating a conversation with three acquaintances and noting how often he actually said the wrong thing.

Initially, the CT therapist acts as a model, showing the client how to evaluate the accuracy of automatic thoughts. By modeling techniques for evaluating the accuracy of automatic thoughts, the therapist hopes to eventually teach the client to do the same on her own. The CT therapist also strives to create a therapeutic climate of *collaboration* that encourages the client to contribute to the evaluation of the logic and accuracy of automatic thoughts (Beck & others, 1979). This approach contrasts with the confrontational approach used by the RET therapist, who directly challenges the client's thoughts and beliefs.

Beck's cognitive therapy has been shown to be effective in treating depression and other psychological disorders, including anxiety disorders, borderline personality disorders, eating disorders, post-traumatic stress disorder, and relationship problems (Beck & Dozois, 2011; Dobson & Dobson, 2009; Gaudiano, 2008). Along with effectively treating depression, cognitive therapy may also help *prevent* depression from recurring, especially if clients learn and then use the skills they have learned in therapy. In one recent study, high-risk patients who had experienced several episodes of depression in the past were much less likely to relapse when they continued cognitive therapy after their depression had lifted (Beck & Alford, 2009). Beck's cognitive therapy techniques have even been adapted to help treat psychotic symptoms, such as the delusions and disorganized thought processes that often characterize schizophrenia (Beck & others, 2009; Miles & others, 2007).

Table 15.6 summarizes the key characteristics of Ellis's rational-emotive therapy and Beck's cognitive therapy.

TABLE 15.6

Comparing Cognitive Therapies

Type of Therapy	Founder	Source of Problems	Treatment Techniques	Goals of Therapy
Rational-emotive therapy (RET)	Albert Ellis	Irrational beliefs	Very directive: Identify, logically dispute, and challenge irrational beliefs	Surrender of irrational beliefs and absolutist demands
Cognitive therapy (CT)	Aaron T. Beck	Unrealistic, distorted perceptions and interpretations of events due to cognitive biases	Directive collaboration: Teach client to monitor automatic thoughts; test accuracy of conclusions; correct distorted thinking and perception	Accurate and realistic perception of self, others, and external events

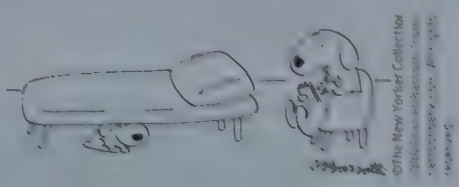
Cognitive-Behavioral Therapy and Mindfulness-Based Therapies

Although we've presented cognitive and behavioral therapies in separate sections, it's important to note that cognitive and behavioral techniques are often combined in therapy. **Cognitive-behavioral therapy** (abbreviated **CBT**) refers to a group of psychotherapies that incorporate techniques from *both* approaches. CBT is based on the assumption that cognitions, behaviors, and emotional responses are interrelated (Hollon & Beck, 2004). Thus, changes in thought patterns will affect moods and behaviors, and changes in behaviors will affect thoughts and moods. Along with challenging maladaptive beliefs and substituting more adaptive cognitions, the therapist uses behavior modification, shaping, reinforcement, and modeling to teach problem solving and to change unhealthy behavior patterns.

cognitive-behavioral therapy (CBT)
Therapy that integrates cognitive and behavioral techniques and that is based on the assumption that thoughts, moods, and behaviors are interrelated.

The hallmark of cognitive-behavioral therapy is its pragmatic approach. Therapists design an integrated treatment plan, utilizing the techniques that are most appropriate for specific problems.

Cognitive-behavioral therapy has been used in the treatment of children, adolescents, and the elderly (Kazdin, 2004; Dautovich & Gum, 2011; Weisz & Kazdin, 2010). Studies have shown that cognitive-behavioral therapy is a very effective treatment for many disorders, including depression, eating disorders, substance abuse, and anxiety disorders (Sheldon, 2011). Cognitive-behavioral therapy can also help decrease the incidence of delusions and hallucinations in patients with schizophrenia and psychotic symptoms by teaching them how to test the reality of their mistaken beliefs and perceptions (Wright & others, 2009).


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"And what do you think will happen if you do get on the couch?"

An emerging approach in cognitive-behavioral therapy involves the use of mindfulness techniques. These new therapies are called ***mindfulness-based interventions***, ***mindfulness-based therapies***, or ***mindfulness and acceptance therapies*** (Chiesa & Malinowski, 2011; Cullen, 2011). As discussed in Chapter 4 on consciousness and 13 on stress, ***mindfulness*** is a meditation technique that involves ***present-centered awareness without judgment*** (Hölzel & others, 2011).

Like traditional cognitive-behavioral therapy, the mindfulness-based therapies involve techniques that target both thoughts and behaviors. Unlike cognitive-behavioral therapy, however, mindfulness-based therapies do not seek to challenge, test, or replace the ***content*** of thoughts. Rather, the goal is to change the ***context*** in which those thoughts are understood (Hayes & others, 2011). That is, clients are taught to observe and ***change their relationship*** to maladaptive thoughts and emotions.

The ability to monitor thoughts and feelings without judgment ideally allows people to experience disturbing thoughts and feelings without reacting to them (Walsh, 2011). How? One important technique is called ***decentering*** (Hayes & others, 2011). Individuals are taught to notice, label, and relate to their thoughts and emotions as "just passing events" rather than to identify with them and allow them to shape experience. By increasing mindful awareness of thoughts, impulses, cravings, and emotions, clients are less likely to act on them or be ruled by them.

Mindfulness-Based Stress Reduction (MBSR) was the first mindfulness-based therapy to earn broad acceptance. Developed by Jon Kabat-Zinn (1990, 2003), MBSR involves a structured program of mindfulness meditation, yoga and mindful body practices, and group discussion. The success of MBSR in the treatment of stress and anxiety helped spark the development of other mindfulness-based therapies targeted towards specific disorders. For example, *Mindfulness-Based Cognitive Therapy (MBCT)* was developed to treat depression, although it has been expanded to include other disorders (Segal & others, 2002, 2004; Didonna, 2009). Mindfulness training has also been incorporated as a core element in other cognitive-behavioral treatments, including therapies designed to treat substance abuse and borderline personality disorder (Hayes & others, 2011; Lynch, 2007).

Although a relatively new approach, the mindfulness-based therapies show promise. For example, a recent meta-analysis of nearly 40 studies found that MBSR and MBCT were effective treatments for mood and anxiety disorders, with long-lasting results (Hofmann & others, 2010). And, one large, carefully controlled study found that MBCT was as effective as antidepressant medications in preventing relapse after acute depression (Segal & others, 2010).

Group and Family Therapy

KEY THEME

› Group therapy involves one or more therapists working with several clients simultaneously.

KEY QUESTIONS

› What are some key advantages of group therapy?

› What is family therapy, and how do its assumptions and techniques differ from those of individual therapy?

Individual psychotherapy offers a personal relationship between a client and a therapist, one that is focused on a single client's problems, thoughts, and emotions. But individual psychotherapy has certain limitations. The therapist sees the client in isolation, rather than within the context of the client's interactions with others. Hence,

the therapist must rely on the client's interpretation of reality and the client's description of relationships with others. Group and family therapy provides the opportunity to overcome these limitations (Norcross & others, 2005; Schachter, 2011).


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"So, would anyone in the group care to respond to what Clifford has just shared with us?"

Group Therapy

Group therapy involves one or more therapists working with several people simultaneously. Group therapy may be provided by a therapist in private practice or at a community mental health clinic. Often, group therapy is an important part of the treatment program for hospital inpatients. Groups may be as small as 3 or 4 people, or as large as 10 or more people (Burlingame & McClendon, 2008).

Virtually any approach—psychodynamic, client-centered, behavioral, or cognitive—can be used in group therapy (Free, 2008; Tasca & others, 2011). And just about any problem that can be handled individually can be dealt with in group therapy (Garvin, 2011).

Group therapy has a number of advantages over individual psychotherapy. First, group therapy is very cost-effective: Because a single therapist can work simultaneously with several people, it is less expensive for the client and less time-consuming for the therapist. Second, rather than relying on a client's self-perceptions about how she relates to other people, the therapist can observe her actual interactions with others. Observing the way clients interact with others in a group may provide unique insights into their personalities and behavior patterns. Sometimes, the group can serve as a microcosm of the client's actual social life (Yalom, 2005; Burlingame & others, 2004).

Third, the support and encouragement provided by the other group members may help a person feel less alone and understand that his or her problems are not unique. For example, a team of family therapists set up group meetings with family members and co-workers of people who had died in the attacks on the World Trade Center (Boss & others, 2003). The therapists' goals included helping the families come to terms with their loss, especially in cases where the bodies of their loved ones had not been recovered. One woman, who had lost dozens of co-workers, some of them close friends, explained the impact of the group sessions in this way:

> As I saw the widows dealing with their loss, and believing it a bit more, it helped me to accept it even more. It was easier with sharing together. Strength in numbers. It makes you feel less alone. Out of the thousands of people you bump into, not everyone can understand what you've been through. If I am with any one of the families, I know they will understand what I am going through. We comfort each other. Even a blood sister might not understand as well.

Group therapies in the aftermath of other disasters, including Hurricane Katrina, have provided similar support (Salloum & others, 2009).

Fourth, group members may provide each other with helpful, practical advice for solving common problems and can act as models for successfully overcoming difficulties. Finally, working within a group gives people an opportunity to try out new behaviors in a safe, supportive environment (Yalom, 2005). For instance, someone who is very shy and submissive can practice more assertive behaviors and receive honest feedback from other group members.

Group therapy is typically conducted by a mental health professional. In contrast, *self-help groups* and *support groups* are typically conducted by nonprofessionals. Self-help groups and support groups have become increasingly popular in the United States and can be very helpful. As discussed in the In Focus box, the potential of these groups to promote mental health should not be underestimated.

group therapy A form of psychotherapy that involves one or more therapists working simultaneously with a small group of clients.

family therapy A form of psychotherapy that is based on the assumption that the family is a system and that treats the family as a unit.

Family and Couple Therapy

Most forms of psychotherapy tend to see a person's problems—and the solutions to those problems—as primarily originating within the individual himself. **Family therapy** operates on a different premise, focusing on the whole family rather than on

IN FOCUS

Self-Help Groups: Helping Yourself by Helping Others

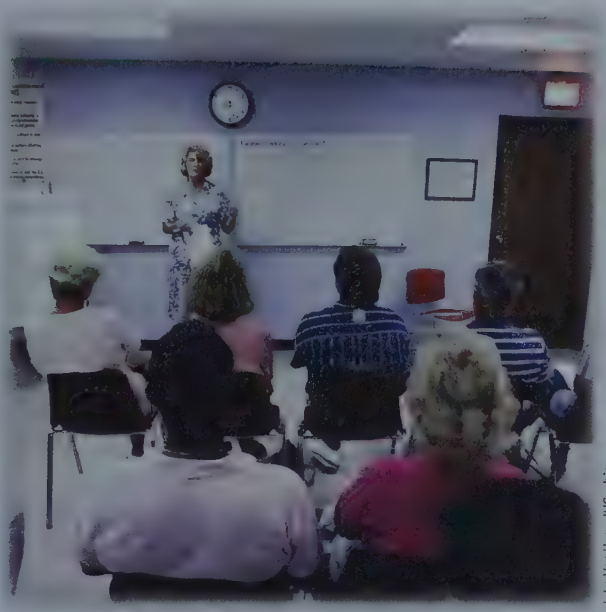
Every month our local newspaper publishes a list of more than 300 self-help and support groups that meet in our area. These groups range from the familiar (Alcoholics Anonymous, Tough-Love) to the obscure (Abused by Religion, Cult Awareness Group, Cross-Dressers of Green County), and from the general (Parents of Adolescents, Effective Black Parenting) to the specific (Multiple Sclerosis—Newly Diagnosed). There are also groups for people dealing with life's transitions and crises, such as divorce, retirement, or bereavement.

What this bewildering array of groups have in common is that all of them are organized and led by nonprofessionals. Typically, such groups are made up of members who have a common problem and meet for the purpose of exchanging psychological support. Some groups are focused on psychological growth and change. Other groups have a more practical emphasis, providing information and advice. The groups either are free or charge nominal fees to cover the cost of materials.

The format of self-help groups varies enormously. Some groups are quite freewheeling, but others are highly structured (Harwood & L'Abate, 2010). Meetings may follow a prescribed format, and there may be rules regulating contacts among group members outside the meetings. For example, our friend Marcia attends weekly meetings of a self-help group called Emotions Anonymous. In Marcia's group, each person takes a turn speaking for five minutes. Interruptions are not allowed, and other members simply listen without responding to the speaker's comments.

Many self-help groups follow a 12-step approach, patterned after the famous 12-step program of Alcoholics Anonymous (AA). The 12 steps of AA include themes of admitting that you have a problem, seeking help from a "higher power," confessing your shortcomings, repairing your relationships with others, and helping other people who have the same problem. These 12 steps have been adapted by many different groups to fit their particular problem. Some psychologists criticize the 12-step approach for its emphasis on the idea that people are "powerless" to cope with their problems on their own and must depend on a higher power and on other group members (Kasl, 1992).

Just how helpful are self-help groups? Research has shown that self-help groups can be as effective as therapy provided by a mental health professional, at least for some psychological problems (Harwood & L'Abate, 2010). Given that many people cannot afford professional counseling, self-help groups may be a cost-effective alternative to psychotherapy for some people (Kazdin & Blase, 2011).



John Van Hasselt/Corbis

Alcoholics Anonymous Many twelve-step self-help groups are modeled after Alcoholics Anonymous. Founded in 1935, today AA has more than 2 million members worldwide. People from all walks of life attend AA meetings, and many credit AA for turning their lives around.

What is not known is *why* self-help groups are effective. Support and encouragement from others are undoubtedly important. So may be the "helper therapy" principle on which all self-help groups are based: People who help other people are themselves helped. But more research is needed to clarify the elements that contribute most to a successful outcome. One study suggests that 12-step attendees who find sponsors and who have a high motivation to change are more likely to stay involved in a program (Kelly & Moos, 2003).

an individual. The major goal of family therapy is to alter and improve the ongoing interactions among family members. Typically, family therapy involves many members of the immediate family, including children and adults, and may also include important members of the extended family, such as grandparents or in-laws (Nichols, 2008; Sexton & others, 2004).

Family therapy is based on the assumption that the family is a *system*, an interdependent unit, not just a collection of separate individuals. The family is seen as a dynamic structure in which each member plays a unique role. According to this view, every family has certain unspoken "rules" of interaction and communication. Some of these tacit rules revolve around issues such as which family members exercise power and how, who makes decisions, who keeps the peace, and what kinds of alliances members have formed among themselves. As such issues are explored, unhealthy patterns of family interaction can be identified and replaced with new "rules" that promote the psychological health of the family as a unit.



Bruce Ayres/Getty Images

A Family Therapy Session Family therapists typically work with all the members of a family at the same time, including young children. The family therapist can then directly observe how family members interact, resolve differences, and exert control over one another. As unhealthy patterns of family interactions are identified, they can often be replaced with new patterns that promote the psychological well-being of the family as a whole.

Family therapy is often used to enhance the effectiveness of individual psychotherapy. For example, patients with schizophrenia are less likely to experience relapses when family members are involved in therapy (Prochaska & Norcross, 2010; Kopelowicz & others, 2007). In many cases, the therapist realizes that the individual client's problems reflect conflict and disturbance in the entire family system (Smerud & Rosenfarb, 2011). For the client to make significant improvements, the family as a whole must become psychologically healthier. Family therapy is also indicated when there is conflict among family members or when younger children are being treated for behavior problems, such as truancy or aggressive behavior (Connell & others, 2007).

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Many family therapists also provide *marital* or *couple therapy* (Bischoff, 2011). (The term *couple therapy* is preferred today because such therapy is conducted with any couple in a committed relationship, whether they are married or unmarried, heterosexual or homosexual). As is the case with family therapy, there are many different approaches to couple therapy (Lebow, 2008; Snyder & Balderrama-Durbin, 2011). For example, *behavioral couple therapy* is based on the assumption that couples are satisfied when they experience more reinforcement than punishment in their relationship. Thus, it focuses on increasing caring behaviors and teaching couples how to constructively resolve conflicts and problems. In general, most couple therapies have the goal of improving communication, reducing negative communication, and increasing intimacy between the pair.

CONCEPT REVIEW 15.1

Types of Psychotherapy

Match each statement below with one of the following types of psychotherapy: (a) psychoanalytic therapy, (b) behavior therapy, (c) humanistic therapy, (d) cognitive therapy, (e) family therapy.

_____ 1. Our problems are not the result of what happens to us, but instead are a function of our cognitive interpretations and irrational thinking about what happens to us.

_____ 2. Maladaptive behavior is learned in the same way as any other behavior. Improvement occurs when the environmental conditions are changed so that adaptive behavior is reinforced and maintained.

_____ 3. A client's psychological problems often reflect a disturbance or conflict in his or her family. If the client's family becomes psychologically healthier, the client is more likely to improve.

_____ 4. The therapist's role is to be nondirective and to provide the client with unconditional positive regard and empathic understanding.

_____ 5. People can regain mental health only by developing insight into their hidden, unconscious conflicts through the techniques of free association, dream interpretation, and transference.

Evaluating the Effectiveness of Psychotherapy

KEY THEME

› Decades of research demonstrate that psychotherapy is effective in helping people with psychological disorders.

KEY QUESTIONS

› What are the common factors that contribute to successful outcomes in psychotherapy?

› What is eclecticism?

Let's start with a simple fact: Most people with psychological symptoms do *not* seek help from mental health professionals (Jagdeo & others, 2009; Kessler & others, 2004). Of course, not everyone has access to professional treatment (Kazdin & Blase, 2011). But many people eventually weather their psychological problems without professional intervention, sometimes seeking help and support from friends and family. And some people eventually improve simply with the passage of time, a phenomenon called *spontaneous remission*. Does psychotherapy offer significant benefits over just waiting for the possible "spontaneous remission" of symptoms?

The basic strategy for investigating this issue is to compare people who enter psychotherapy with a carefully selected, matched control group of people who do not receive psychotherapy (Freeman & Power, 2007; Nezu & Nezu, 2008). During the past half-century, hundreds of such studies have investigated the effectiveness of the major forms of psychotherapy (Cooper, 2008; Nathan & Gorman, 2007). To combine and interpret the results of such large numbers of studies, researchers have used a statistical technique called *meta-analysis*. Meta-analysis involves pooling the results of several studies into a single analysis, essentially creating one large study that can reveal overall trends in the data.

When meta-analysis is used to summarize studies that compare people who receive psychotherapy treatment to no-treatment controls, researchers consistently arrive at the same conclusion: *Psychotherapy is significantly more effective than no treatment*. On average, the person who completes psychotherapy treatment is better off than about 80 percent of those in the untreated control group (Cooper, 2008; Lambert & Ogles, 2004).

The benefits of psychotherapy usually become apparent in a relatively short time. As shown in Figure 15.4, approximately 50 percent of people show significant improvement by the eighth weekly session of psychotherapy. By the end of six months of weekly psychotherapy sessions, about 75 percent are significantly improved (Baldwin & others, 2009; Lambert & others, 2001).

The gains that people make as a result of psychotherapy also tend to endure long after the therapy has ended, sometimes for years (Lambert & Ogles, 2004; Shedler, 2010). Even brief forms of psychotherapy tend to produce beneficial and long-lasting changes (Power, 2005). And, multiple meta-analyses have found that both individual and group therapy are equally effective in producing significant gains in psychological functioning (Burlingame & others, 2004; Cuijpers & others, 2008).

Brain-imaging technologies are providing another line of evidence demonstrating the power of psychotherapy to bring about change (Karlsson, 2011). In one study, PET scans were used to measure brain activity before and after 10 weeks of therapy for obsessive–compulsive disorder (Schwartz & others, 1996; Schwartz & Begley, 2002). The psychotherapy patients who improved showed the same changes in brain function that are associated with effective drug therapy for this disorder (see Chapter 14).

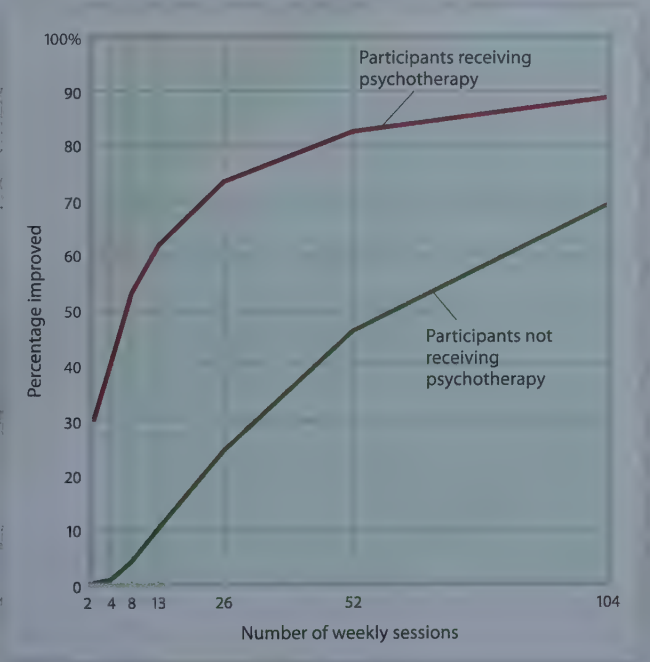


FIGURE 15.4 Psychotherapy Versus No Treatment This graph depicts the rates of improvement for more than 2,000 people in weekly psychotherapy and for 500 people who did not receive psychotherapy. As you can see, after only eight weekly sessions, more than 50 percent of participants receiving psychotherapy improved significantly. After the same length of time, only 4 percent of participants not receiving psychotherapy showed "spontaneous remission" of symptoms. Clearly, psychotherapy accelerates both the rate and degree of improvement for those experiencing psychological problems.

Source: Adapted from McNeilly & Howard (1991). Reprinted by permission of Guilford Press.

Similarly, as we'll show you later in this chapter, PET scans of patients with depression show changes in brain functioning toward more normal levels after 12 weeks of interpersonal therapy (Martin & others, 2001). In other words, psychotherapy alone produces distinct physiological changes in the brain—changes that are associated with a reduction in symptoms (Arden & Linford, 2009; Karlsson, 2011).

Nevertheless, it's important to note that psychotherapy is *not* a miracle cure. While most people experience significant benefits from psychotherapy, not everyone benefits to the same degree. Some people who enter psychotherapy improve only slightly or not at all. Others drop out early, presumably because therapy wasn't working as they had hoped (Barrett & others, 2008). And in some cases, people get worse despite therapeutic intervention (Boisvert & Faust, 2003).

Is One Form of Psychotherapy Superior?

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"The drug has, however, proved more effective than traditional psychoanalysis."

Given that the major types of psychotherapy use different assumptions and techniques, does one type of psychotherapy stand out as more effective than the others? In some cases, one type of psychotherapy *is* more effective than another in treating a particular problem (Barlow, 2008; Budd & Hughes, 2009). For example, cognitive therapy and interpersonal therapy are effective in treating depression (Craighead & others, 2007). Cognitive, cognitive-behavioral, and behavior therapies tend to be more successful than insight-oriented therapies in helping people who are experiencing panic disorder, obsessive–compulsive disorder, and phobias (Craske & Barlow, 2008; Clark & others, 2003; Siev & Chambless, 2007). And, insight-oriented therapies are also less effective than other therapies in the treatment of disorders characterized by severe psychotic symptoms, such as schizophrenia (Mueser & Glynn, 1993).

However, when meta-analysis techniques are used to assess the collective results of treatment outcome studies, a surprising but consistent finding emerges: *In general, there is little or no difference in the effectiveness of different psychotherapies.* Despite sometimes dramatic differences in psychotherapy techniques, all of the standard psychotherapies have very similar success rates (Cooper, 2008; Luborsky & others, 2002; Wampold, 2001).

One important qualification must be made at this point. In this chapter, we've devoted considerable time to explaining four major approaches to therapy: psychoanalytic and psychodynamic therapy; humanistic therapy; behavior therapy; and cognitive and cognitive-behavioral therapies. While distinct, all of these psychotherapy approaches have in common the fact that they are *empirically supported treatments.* In other words, they are based on known psychological principles, have been subjected to controlled scientific trials, and have demonstrated their effectiveness in helping people with psychological problems (David & Montgomery, 2011).

In contrast, one ongoing issue in contemporary psychotherapy is the proliferation of *untested* psychotherapies. The fact that there is little difference in outcome among the empirically supported therapies does *not* mean that any and every form of psychotherapy is equally effective (Herbert & others, 2000; Lilienfeld & others, 2005). Too often, untested therapy techniques are heavily marketed and promoted, promising miraculous cures with little or no empirical research to back up their claims (A. A. Lazarus, 2000; Lilienfeld, 2007).

We examine the empirical evidence for one heavily promoted therapy in the Science Versus Pseudoscience box, "EMDR: Can You Wave Your Fears Away?" on page 632.

What Factors Contribute to Effective Psychotherapy?

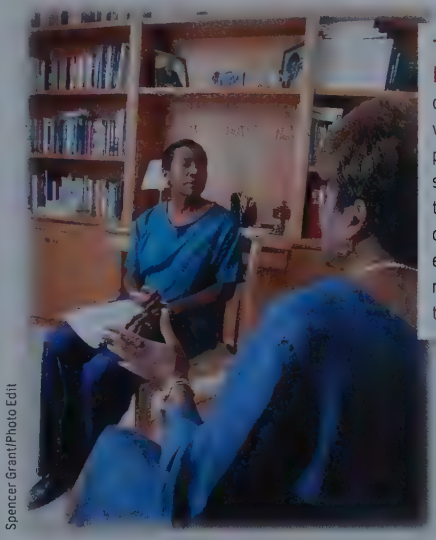
How can we explain the fact that different forms of psychotherapy are basically equivalent in producing positive results? One possible explanation is that the factors that are crucial to producing improvement are present in *all* effective therapies.

Researchers have identified a number of common factors that are related to a positive therapy outcome (Sparks & others, 2008; Sprenkle & others, 2009).

First and most important is the quality of the *therapeutic relationship* (Cooper, 2008; Norcross & Lambert, 2011; Norcross & Wampold, 2011a). When psychotherapy is helpful, the therapist–client relationship is characterized by mutual respect, trust, and hope. Working in a cooperative alliance, both people are actively trying to achieve the same goals.

Second, certain *therapist characteristics* are associated with successful therapy. Helpful therapists have a caring attitude and the ability to listen empathically. They are genuinely committed to their clients' welfare (Aveline, 2005). Regardless of approach, they tend to be warm, sensitive, and responsive people, and they are perceived as sincere and genuine (Beutler & others, 2004).

Third, *client characteristics* are important (Clarkin & Levy, 2004). If the client is motivated, committed to therapy, and actively involved in the process, a successful outcome is much more likely (Tallman & Bohart, 1999). Emotional and social maturity and the ability to express thoughts and feelings are important. Clients who are optimistic, who expect psychotherapy to help them with their problems, and who don't have a previous history of psychological disorders are more likely to benefit from therapy (Leon & others, 1999). Finally, *external circumstances,* such as a stable living situation and supportive family members, can enhance the effectiveness of therapy.



Spencer Grant/Photo Edit

Therapeutic Sensitivity to Cultural Differences A therapist's sensitivity to a client's cultural values can affect the ability to form a good working relationship and, ultimately, the success of psychotherapy (Thompson & others, 2004). Thus, some clients prefer to see therapists who are from the same ethnic or cultural background, as is the case with the African American therapist and client shown here. In general, therapists have become more attuned to the important role played by culture in effective psychotherapy.

Effective therapists are also sensitive to the *cultural differences* that may exist between themselves and their clients (Smith & others, 2011; Sue & Sue, 2008b). As described in the Culture and Human Behavior box on page 634, cultural differences can be a barrier to effective psychotherapy. Increasingly, training in cultural sensitivity and multicultural issues is being incorporated into psychological training programs in the United States (Sammons & Speight, 2008).

Notice that none of these factors are specific to any particular brand of psychotherapy. However, this does not mean that differences between psychotherapy techniques are completely irrelevant. Rather, it's important that there be a good "match" between the person seeking help and the specific psychotherapy techniques used (Norcross & Wampold, 2011b). One person may be very comfortable with psychodynamic techniques, such as exploring childhood memories and free association. Another person might be more open to behavioral techniques, like systematic desensitization. For therapy to be optimally effective, the individual should feel comfortable with both the therapist and the therapist's approach to therapy.



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"I utilize the best from Freud, the best from Jung and the best from my Uncle Marty, a very smart fellow."

Increasingly, such a personalized approach to therapy is being facilitated by the movement of mental health professionals toward **eclecticism**—the pragmatic and integrated use of diverse psychotherapy techniques (Hollanders,

eclecticism (eh-KLEK-tuh-sizz-um) The pragmatic and integrated use of techniques from different psychotherapies.

SCIENCE VERSUS PSEUDOSCIENCE

EMDR: Can You Wave Your Fears Away?

In the late 1980s, a psychology graduate student named Francine Shapiro was walking alone in a park, grappling with some troubling thoughts. According to Shapiro, "I noticed that when a disturbing thought entered my mind, my eyes spontaneously started moving back and forth. At the same time, I noticed that my disturbing thought had shifted from consciousness, and when I brought it back to mind, it no longer bothered me as much" (Shapiro & Forrest, 1997, 2004). Speculating that her back-and-forth eye movements were simulating the rapid eye movements (REM) of dreaming sleep, Shapiro developed a treatment technique in which patients suffering from traumatic memories visually followed her waving finger while simultaneously holding a mental image of disturbing memories, events, or situations.

Ultimately, Shapiro earned her doctorate in psychology by treating 22 patients with post-traumatic stress disorder (PTSD) with her new therapy, which she dubbed **eye movement desensitization reprocessing,** abbreviated **EMDR.** In two published papers, Shapiro (1989a, 1989b) reported that almost all of her patients experienced significant relief from their symptoms after just *one* EMDR therapy session (see also Shapiro, 2007).

This was the beginning of what was to become one of the fastest-growing—and most lucrative—therapeutic techniques of the last 20 years (Herbert & others, 2000). How popular is EMDR? Since Shapiro established her EMDR Institute in 1990, more than 70,000 therapists have been trained in EMDR. Millions of patients have been treated with the new therapy (EMDR Institute, 2011).

Since its launch, the claims, techniques, and jargon of EMDR have undergone some changes. While originally touted as a one-session treatment for the distress associated with traumatic memories in PTSD (Shapiro, 1989a), EMDR therapy today frequently involves multiple sessions. According to Shapiro (1995), comprehensive EMDR treatment involves eight phases, which combine elements of psychodynamic, behavioral, and cognitive therapies. Along with the eye movements, other forms of "bilateral stimulation" may be used, such as tones in alternating ears or taps on different sides of the body.

Along with post-traumatic stress disorder, EMDR has been used to treat panic disorder and other anxiety disorders, addiction, substance abuse, and sleep disorders. Proponents claim that EMDR is also effective in overcoming depression, phobias, pathological gambling, and self-esteem problems, as well as helping athletes and workers achieve "peak performance" (see EMDR Institute, 2011; Shapiro & Forrest, 2004).

Originally, Shapiro (1989b) contended that the eye movements simulated brain processes during sleep, "releasing" and "integrating" traumatic memories. Later, Shapiro (1995) proposed that EMDR facilitates what she calls "Accelerated Information Processing," in which "dysfunctionally stored information can be properly assimilated through a dynamically activated processing system." Supposedly, EMDR "accelerates a natural information processing" that helps heal the nervous system.

Is EMDR "the breakthrough therapy for overcoming anxiety, stress, and trauma," as is claimed on the cover of Shapiro's 1997 book? Does it represent a "paradigm shift" in psychotherapy, as its founder (Shapiro, 1995, 2007) claims? Let's consider the evidence.

Does EMDR Provide Therapeutic Benefits Compared to No Treatment?

Yes. Numerous studies have shown that patients experience relief from symptoms of anxiety after EMDR. In a meta-analysis of dozens of studies examining EMDR, Canadian psychologists Paul Davidson and Kevin Parker (2001) concluded the following: "When outcomes of EMDR treatment are compared with no treatment, and when outcomes are compared with pretreatment status, clients are better off with EMDR treatment than without." Other researchers have also found that patients benefit from EMDR and that EMDR is more effective than no treatment at all (DeBell & Jones, 1997; Goldstein & others, 2000).

Is EMDR More Effective Than Other Standard Therapies?

The alert reader will have noticed that EMDR has many elements in common with other treatment techniques, some of them well established and based on well-documented psychological principles. For example, **exposure therapy** is one technique that has



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Eye Movement Desensitization Reprocessing (EMDR)
In EMDR therapy, the client visually follows the therapist's moving finger while mentally focusing on a traumatic memory or vivid mental image of a troubling situation. Supposedly, the rhythmic eye movements help the client to "release" and "integrate" the trauma.

■ **eye movement desensitization reprocessing (EMDR)** Therapy technique in which the client holds a vivid mental image of a troubling event or situation while rapidly moving his or her eyes back and forth in response to the therapist's waving finger or while the therapist administers some other form of bilateral stimulation.

2007; Lambert & others, 2004). Today, therapists identify themselves as eclectic more often than any other approach (Lambert & Ogles, 2004; Karpiak & others, 2005). *Eclectic psychotherapists* carefully tailor the therapy approach to the problems and characteristics of the person seeking help. For example, an eclectic therapist might integrate insight-oriented techniques with specific

long been recognized as an effective treatment for PTSD and phobias. Exposure therapy is related to systematic desensitization: The person gradually and repeatedly relives the frightening experience under controlled conditions to help him overcome his fear of the dreaded object or situation and establish more adaptive beliefs and cognitions. Using a combination of behavioral and cognitive techniques, exposure therapy has a high rate of success in the treatment of anxiety disorders (Powers & others, 2010).

Is EMDR more effective than exposure therapy or other cognitive-behavioral treatments? No. When Davidson and Parker (2001) compared the effectiveness of EMDR to other exposure treatments, no difference was found. EMDR was no more effective than standard treatments for anxiety disorders, including PTSD. Other researchers have found that EMDR is *less* effective than exposure therapy for PTSD (Albright & Thyer, 2010; Taylor & others, 2003).

Are the Eye Movements Necessary?

Several research studies have compared standard EMDR with other treatments that duplicate all aspects of the treatment *except* the eye-movement component. For example, some studies have compared treatment effects between an eye-movement condition (EMDR) and "sham" EMDR, a kind of placebo condition in which the participants fixed their eyes on a bright light that did not move or engaged in finger tapping with alternate hands. All these studies found *no difference* between "real" EMDR and "sham" EMDR (DeBell & Jones, 1997; Feske & Goldstein, 1997; Goldstein & others, 2000). In their meta-analysis, Davidson and Parker (2001) agreed with other researchers: There was *no difference* in outcome between treatments that incorporated eye movements and the "sham" EMDR that did not.

So if you remove the eye movements from the EMDR treatment protocol, what is left? Harvard psychologist Richard McNally (1998), an expert in the treatment of anxiety disorders, puts it succinctly: "What is effective in EMDR is not new, and what is new is not effective." Psychologists Gerald Rosen and Jeffrey Lohr (1997) are more blunt:

> Shapiro took existing elements from cognitive-behavior therapies, added the unnecessary ingredient of finger waving, and then took the technique on the road before science could catch up.

Is EMDR a Pseudoscience?

Some psychologists argue that EMDR is just that—a pseudoscience (Devilly, 2005; Lilienfeld, 1998; Rosen & others, 1999). Psychologist James D. Herbert and his colleagues (2000) note several ways in which EMDR displays the fundamental characteristics of a pseudoscience, which were discussed in Chapter 1:

> EMDR appears to possess the outward form of science but little of its substance. The appearance of science, such as case studies reported in peer reviewed journals, selective publicity of weak tests of effectiveness, [and] scientific-sounding jargon . . . serves to obscure EMDR's lack of scientific substance and have persuaded many of its scientific legitimacy. Although there is little evidence to support the strong claims of EMDR's proponents, this treatment has resulted in a significant financial return.

The case of EMDR highlights an ongoing problem in contemporary psychotherapy. Too often, "revolutionary" new therapies are developed, advertised, and marketed directly to the public—and to therapists—*before* controlled scientific studies of their effectiveness have been conducted (Lazarus, 2000). Many of the untested therapies are ineffective or, as in the case of EMDR, no more effective than established therapies (Lilienfeld & others, 2003; Lohr & others, 2003). Others are downright dangerous, such as the "rebirthing" technique that resulted in the death of a young girl in Colorado in April 2000. Ten-year-old Candace Newmaker suffocated after being wrapped in a blanket, covered with pillows, and restrained by four adult "therapists" who taunted her when she cried, pleaded for air, and repeatedly told them she could not breathe.

Like many pseudosciences, such fringe therapies rely on anecdotes and testimonials to persuade others of their efficacy. Their proponents often resort to vague, scientific-sounding explanations of their mechanisms rather than established—and testable—scientific principles (Lilienfeld, 2011; Lilienfeld & others, 2008). James Herbert and his colleagues (2000) argue that new therapeutic techniques should be tested *before* they are put into widespread use, not after. The conditions that new therapies should meet are summarized in the table below.

The Burden of Proof

Psychologist James D. Herbert and his colleagues (2000) argue that before being put into widespread use, new therapies should provide empirically based answers to the following questions:

- Does the treatment work better than no treatment?
- Does the treatment work better than a placebo?
- Does the treatment work better than standard treatments?
- Does the treatment work through the processes that its proponents claim?

Source: Herbert & others (2000).

behavioral techniques to help someone suffering from extreme shyness. A related approach is *integrative* psychotherapy. Integrative psychotherapists also use multiple approaches to therapy, but they tend to blend them together rather than choosing different approaches for different clients (Lazarus, 2008; Stricker & Gold, 2008).

exposure therapy Behavioral therapy for phobias, panic disorder, post-traumatic stress disorder, or related anxiety disorders in which the person is repeatedly exposed to the disturbing object or situation under controlled conditions.

CULTURE AND HUMAN BEHAVIOR

Cultural Values and Psychotherapy

The goals and techniques of many established approaches to psychotherapy tend to reflect European and North American cultural values (McGoldrick & others, 2005; T. B. Smith & others, 2011). In this box, we'll look at how those cultural values can clash with the values of clients from other cultures, diminishing the effectiveness of psychotherapy.

A Focus on the Individual

In Western psychotherapy, the client is usually encouraged to become more assertive, more self-sufficient, and less dependent on others in making decisions. Problems are assumed to have an internal cause and are expected to be solved by the client alone. Therapy emphasizes meeting the client's individual needs, even if those needs conflict with the demands of significant others. In collectivistic cultures, however, the needs of the individual are much more strongly identified with the needs of the group to which he or she belongs (Brewer & Chen, 2007; Pedersen & others, 2008; Sue & Sue, 2008).

For example, traditional Native Americans are less likely than European Americans to believe that personal problems are due to an internal cause within the individual (Garrett, 2008). Instead, one person's problems may be seen as a problem for the entire community to resolve.

In traditional forms of Native American healing, family members, friends, and other members of the community may be asked to participate in the treatment or healing rituals. One type of therapy, called *network therapy*, is conducted in the person's home and can involve as many as 70 members of the individual's community or tribe (LaFromboise & others, 1993b).

Latino cultures, too, emphasize interdependence over independence. In particular, they stress the value of *familismo*—the importance of the extended family network. Because the sense of family is so central to Latino culture, psychologist Lilian Comas-Diaz (1993) recommends that members of the client's extended family, such as grandparents and in-laws, be actively involved in psychological treatment.

Many collectivistic Asian cultures also emphasize a respect for the needs of others (Lee & Mock, 2005). The Japanese psychotherapy called *Naikan therapy* is a good example of how such cultural values affect the goals of psychotherapy (Tanaka-Matsumi, 2004). According to Naikan therapy, being self-absorbed is the surest path to psychological suffering. Thus, the goal of Naikan therapy is to replace the focus on the self with a sense of gratitude and obligation toward others. Rather than talking about how his own needs were not met by family members, the Naikan client is asked to meditate on how he has failed to meet the needs of others.

The Importance of Insight

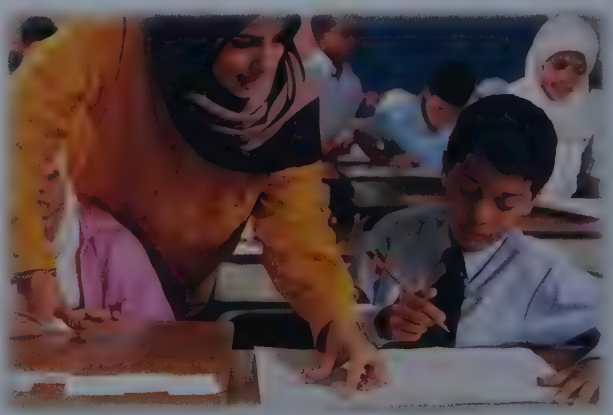
Psychodynamic, humanistic, and cognitive therapies all stress the importance of insight or awareness of an individual's thoughts and feelings. But many cultures do *not* emphasize the importance of exploring painful thoughts and feelings in resolving psychological problems. For example, Asian cultures stress that mental health is enhanced by the avoidance of negative thinking. Hence, a depressed or anxious person in China and many other Asian countries would be encouraged to *avoid* focusing on upsetting thoughts (Kim & Park, 2008).

Intimate Disclosure Between Therapist and Client

Many Western psychotherapies are based on the assumption that the clients will disclose their deepest feelings and most private thoughts to their therapists. But in some cultures, intimate details of one's personal life would never be discussed with a stranger. Asians are taught to disclose intimate details only to very close friends. For example, a young Vietnamese student of ours vowed never to return to see a psychologist she had consulted about her struggles with depression. The counselor, she complained, was too "nosy" and asked too many personal questions. In many cultures, people are far more likely to turn to family members or friends than they are to mental health professionals (Leung & Boehnlein, 2005).

The demands for emotional openness may also clash with cultural values. In Asian cultures, people tend to avoid the public expression of emotions and often express thoughts and feelings nonverbally. Native American cultures tend to value the restraint of emotions rather than the open expression of emotions (Garrett, 2006; LaFromboise & others, 1993b).

Recognizing the need for psychotherapists to become more culturally sensitive, the American Psychological Association has recommended formal training in multicultural awareness for all psychologists (Fouad & Arredondo, 2007; Tanaka-Matsumi, 2011). The APA (2003) has also published extensive guidelines for psychologists who provide psychological help to culturally diverse populations. Interested students can download a copy of the APA guidelines at www.apa.org/pi/multiculturalguidelines.pdf.



Steve Liss/The Gamma-Liaison Network

Cultural Values Even after immigrating to the United States, many people maintain strong ties with their cultural heritage. Here, Arab American children attend an Islamic school. Notice that the young female students as well as the teacher are wearing the traditional *chador*, or veil. The traditional beliefs of some cultures, such as the Islamic belief that women should be modest and obedient to their husbands, may conflict with the values inherent in Western psychotherapies.

CONCEPT REVIEW 15.2

Elements of Effective Psychotherapy

Identify each statement below as true or false. If a statement is false, rewrite it to correct it.

_____ 1. Meta-analysis is the most effective psychoanalytic technique.

_____ 2. In general, psychotherapy is no more effective than talking with a friend.

_____ 3. Behavior therapy is the single most effective therapy available for all psychological disorders.

_____ 4. Because the principles of effective therapy are universal, cultural differences between clients and therapists have no impact on the effectiveness of psychotherapy.

_____ 5. Regardless of which form of therapy they practice, the most effective psychotherapists are perceived as warm, genuine, and sincere.

_____ 6. A client's attitude toward therapy has minimal impact on therapy's effectiveness.

Biomedical Therapies

KEY THEME

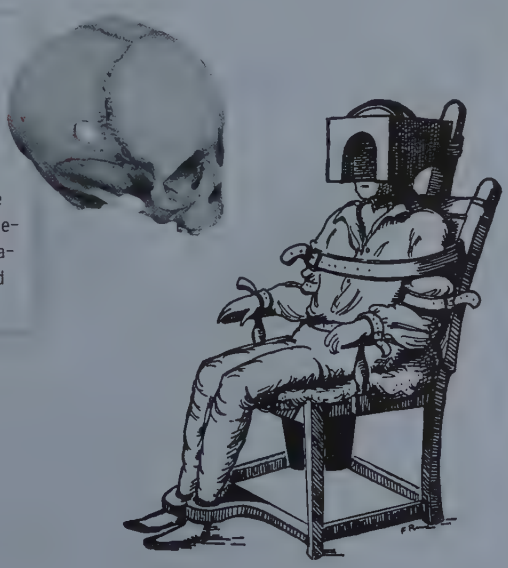
› The biomedical therapies are medical treatments for the symptoms of psychological disorders and include medication and electroconvulsive therapy.

KEY QUESTIONS

› What medications are used to treat the symptoms of schizophrenia, anxiety, bipolar disorder, and depression, and how do they achieve their effects?

› What is electroconvulsive therapy, and what are its advantages and disadvantages?

Medical treatments for psychological disorders actually predate modern psychotherapy by hundreds of years. In past centuries, patients were whirled, soothed, drenched, restrained, and isolated—all in an attempt to alleviate symptoms of psychological disorders. Today, such "treatments" seem cruel, inhumane, and useless. Keep in mind, however, that these early treatments were based on the limited medical knowledge of the time. As you'll see in this section, some of the early efforts to treat psychological disorders did eventually evolve into treatments that are widely used today.





Historical Treatments for Mental Illness *Left:* Found in Peru, this pre-Columbian skull shows the results of primitive surgery on the brain, called *trephining*, presumably as a treatment to allow evil spirits to leave the body. *Middle:* A "tranquilizing chair" was developed in the early 1800s to restrain and sedate unmanageable patients. *Right:* An early treatment apparatus called the "circulating swing" involved spinning patients.

(left): The Granger Collection; (middle) Corbis; (right) Culver Pictures



blickwinkel/Alamy

The First Antipsychotic Drug More than 2,000 years ago, ancient Hindu medical texts prescribed the use of an herb derived from *Rauwolfia serpentina*, or snakeroot plant, to treat epilepsy, insomnia, and other ailments. But its primary use was to treat *oonmaad*—a Sanskrit term for an abnormal mental condition that included disruptions in "wisdom, perception, knowledge, character, creativity, conduct, and behavior" (Bhatara & others, 1997). Today it is known that the herb has a high affinity for dopamine receptors in the brain.

For the most part, it was not until the twentieth century that effective biomedical therapies were developed to treat the symptoms of mental disorders. Today, the most common biomedical therapy is the use of **psychotropic medications**—prescription drugs that alter mental functions and alleviate psychological symptoms. Although often used alone, psychotropic medications are increasingly combined with psychotherapy (Kaut & Dickinson, 2007; Sudak, 2011).

Antipsychotic Medications

For more than 2,000 years, traditional practitioners of medicine in India used an herb derived from the snakeroot plant to diminish the psychotic symptoms commonly associated with schizophrenia: hallucinations, delusions, and disordered thought processes (Bhatara & others, 1997). The same plant was used in traditional Japanese medicine to treat anxiety and restlessness (Jilek, 1993). In the 1930s, Indian physicians discovered that the herb was also helpful in the treatment of high blood pressure. They developed a synthetic version of the herb's active ingredient, called *reserpine*.

Reserpine first came to the attention of American researchers as a potential treatment for high blood pressure. But it wasn't until the early 1950s that American researchers became aware of research in India demonstrating the effectiveness of reserpine in treating schizophrenia (Frankenburg, 1994).

It was also during the 1950s that French scientists began investigating the psychoactive properties of another drug, called *chlorpromazine*. Like reserpine, chlorpromazine diminished the psychotic symptoms commonly seen in schizophrenia. Hence, reserpine and chlorpromazine were dubbed **antipsychotic medications.** Because chlorpromazine had fewer side effects than reserpine, it nudged out reserpine as the preferred medication for treating schizophrenia-related symptoms. Since then, chlorpromazine has been better known by its trade name, *Thorazine,* and is still used to treat psychotic symptoms. The antipsychotic drugs are also referred to as *neuroleptic medications* or simply *neuroleptics.*

How do these drugs diminish psychotic symptoms? Reserpine and chlorpromazine act differently on the brain, but both drugs reduce levels of the neurotransmitter called *dopamine.* Since the development of these early drugs, more than 30 other antipsychotic medications have been developed (see Table 15.7). These antipsychotic medications also act on dopamine receptors in the brain (Abi-Dargham, 2004; Laruelle & others, 2003; Richtand & others, 2007).

psychotropic medications (*sy*-ko-TRO-pick) Drugs that alter mental functions, alleviate psychological symptoms, and are used to treat psychological or mental disorders.

antipsychotic medications (*an*-tee-sy-KOT-ick or anti-si-KOT-ick) Prescription drugs that are used to reduce psychotic symptoms; frequently used in the treatment of schizophrenia; also called *neuroleptics.*

TABLE 15.7

Antipsychotic Medications

	Generic Name	Trade Name
Typical Antipsychotics	Chlorpromazine	Thorazine
	Fluphenazine	Prolixin
	Trifluoperazine	Stelazine
	Thioridazine	Mellaril
	Thiothixene	Navane
	Haloperidol	Haldol
Atypical Antipsychotics	Clozapine	Clozaril
	Risperidone	Risperdal
	Olanzapine	Zyprexa
	Sertindole	Serlect
	Quetiapine	Seroquel
	Aripiprazole	Abilify
	Amisulpride	Solian

Source: Adapted from Julien (2012)

JB Reed/Bloomberg via Getty Images

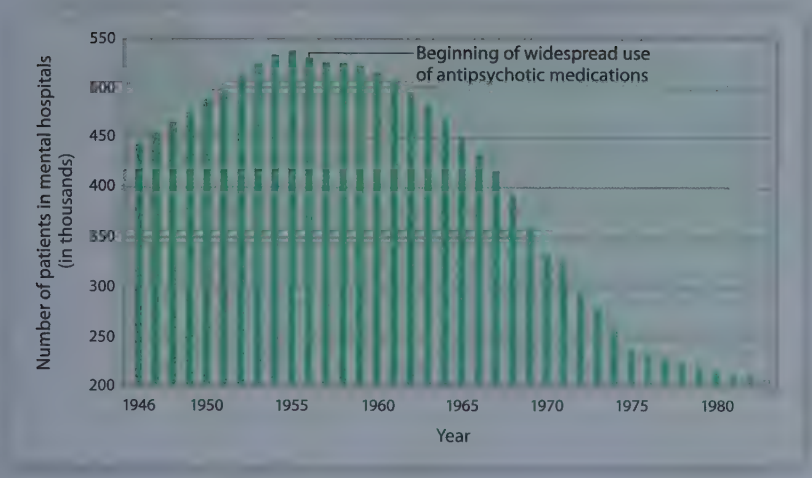


FIGURE 15.5 Change in the Number of Patients Hospitalized for Mental Disorders, 1946–1983
When the first antipsychotic drugs came into wide use in the late 1950s, the number of people hospitalized for mental disorders began to drop sharply.

Source: Adapted from Julien (2012).

The first antipsychotics effectively reduced the *positive symptoms* of schizophrenia—hallucinations, delusions, and disordered thinking (see Chapter 14). This therapeutic effect had a revolutionary impact on the number of people hospitalized for schizophrenia. Until the 1950s, patients with schizophrenia were thought to be incurable. These chronic patients formed the bulk of the population in the "back wards" of psychiatric hospitals. With the introduction of the antipsychotic medications, however, the number of patients in mental hospitals decreased dramatically (see Figure 15.5).

Drawbacks of Antipsychotic Medications

Even though the early antipsychotic drugs allowed thousands of patients to be discharged from hospitals, these drugs had a number of drawbacks. First, they didn't actually *cure* schizophrenia. Psychotic symptoms often returned if a person stopped taking the medication.

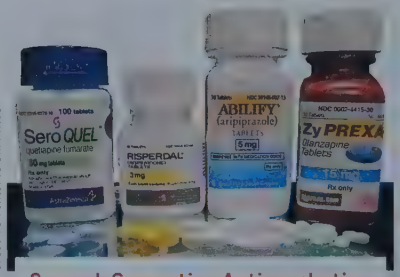
Second, the early antipsychotic medications were not very effective in eliminating the *negative symptoms* of schizophrenia—social withdrawal, apathy, and lack of emotional expressiveness. In some cases, the drugs even made negative symptoms worse.

Third, the antipsychotics often produced unwanted side effects, such as dry mouth, weight gain, constipation, sleepiness, and poor concentration (Stahl, 2009).

Fourth, the fact that the early antipsychotics *globally* altered brain levels of dopamine turned out to be a double-edged sword. Dopamine pathways in the brain are involved not only in psychotic symptoms but also in normal motor movements. Consequently, the early antipsychotic medications could produce motor-related side effects—muscle tremors, rigid movements, a shuffling gait, and a masklike facial expression. This collection of side effects occurred so commonly that mental hospital staff members sometimes informally referred to it as the "Thorazine shuffle."

Even more disturbing, the long-term use of antipsychotic medications causes a small percentage of people to develop a potentially irreversible motor disorder called *tardive dyskinesia*. Tardive dyskinesia is characterized by severe, uncontrollable facial tics and grimaces, chewing movements, and other involuntary movements of the lips, jaw, and tongue.

Closely tied to the various side effects of the first antipsychotic drugs is a fifth problem: the "revolving door" pattern of hospitalization, discharge, and rehospitalization. Schizophrenic patients, once stabilized by antipsychotic medication, were released from hospitals into the community. But because of the medication's unpleasant side effects, inadequate medical follow-up, or both, many patients eventually stopped taking the medication. When psychotic symptoms returned, the patients were rehospitalized.



Creative Ventures Unlimited

Second-Generation Antipsychotics

In terms of dollar amount, antipsychotic medications were the highest-selling class of pharmaceuticals in the U.S. in 2010, generating over 10 billion dollars in annual sales (IMS Health, 2010). Helping to fuel the increase in sales was the development of the new atypical antipsychotic medications, which are much more expensive than the older, traditional antipsychotic drugs. A second factor is the increased off-label use of antipsychotic medications for non-psychotic conditions, including the anxiety disorders and bipolar disorder—despite the fact that there is little evidence to support the use of these powerful drugs to treat the symptoms of these disorders (Alexander & others, 2010; Comer & others, 2011).

The Atypical Antipsychotics

Beginning around 1990, a second generation of antipsychotic drugs began to be introduced. Called **atypical antipsychotic medications,** these drugs affect brain levels of dopamine and *serotonin.* The first atypical antipsychotics were *clozapine* and *risperidone.* More recent atypical antipsychotics include *olanzapine, sertindole,* and *quetiapine.*

The atypical antipsychotics have several advantages over the older antipsychotic drugs (Julien, 2012). First, the new drugs are less likely to cause movement-related side effects. That's because they do not block dopamine receptors in the movement areas of the brain. Instead, they more selectively target dopamine receptors in brain areas associated with psychotic symptoms. The atypical antipsychotics are also much more effective in treating the negative symptoms of schizophrenia—apathy, social withdrawal, and flat emotions (Woo & others, 2009). Some patients who have not responded to the older antipsychotic drugs improve dramatically with the new medications (Turner & Stewart, 2006).

The atypical antipsychotic medications also appear to lessen the incidence of the "revolving door" pattern of hospitalization and rehospitalization. As compared to discharged patients taking the older antipsychotic medications, patients taking risperidone or olanzapine are much less likely to relapse and return to the hospital (Bhanji & others, 2004).

The atypical antipsychotic medications sparked considerable hope for better therapeutic effects, fewer adverse reactions, and greater patient compliance. Although they were less likely to cause movement-related side effects, the second-generation antipsychotics caused some of the same side effects as the first-generation antipsychotics, including weight gain and cardiac problems. The atypical antipsychotic medications are also associated with a sharply increased risk of developing diabetes, especially in patients younger than age 40 (Angell, 2011; Julien, 2012). Equally important, large-scale studies have demonstrated that the newer antipsychotic medications do *not* produce greater improvements than the older traditional antipsychotics (Crossley & others, 2010).

Antianxiety Medications

Anxiety that is intense and persistent can be disabling, interfering with a person's ability to eat, sleep, and function. **Antianxiety medications** are prescribed to help people deal with the problems and symptoms associated with pathological anxiety (see Table 15.8).

The best-known antianxiety drugs are the *benzodiazepines,* which include the trade-name drugs *Valium* and *Xanax.* These antianxiety medications calm jittery feelings, relax the muscles, and promote sleep. They used to go by the name "tranquilizers" because of this effect. They take effect rapidly, usually within an hour or so. In general, the benzodiazepines produce their effects by increasing the level of *GABA,* a neurotransmitter that inhibits the transmission of nerve impulses in the brain and slows brain activity (see Chapter 2).

Taken for a week or two, and in therapeutic doses, the benzodiazepines can effectively reduce anxiety levels. However, the benzodiazepines have several potentially dangerous side effects. First, they can reduce coordination, alertness, and reaction time. Second, their effects can be intensified when they are combined with alcohol and many other drugs, including over-the-counter antihistamines. Such a combination can produce severe drug intoxication, even death.

Third, the benzodiazepines can be physically addictive if taken in large quantities or over a long period of time. If physical dependence occurs, the person must withdraw from the drug gradually, as abrupt withdrawal can produce life-threatening symptoms. Because of their addictive potential, the benzodiazepines are less widely prescribed today.

A newer antianxiety drug with the trade name *Buspar* has fewer side effects. Buspar is not a benzodiazepine, and it does not affect the neurotransmitter GABA. In fact,

exactly how Buspar works is unclear, but it is believed to affect brain dopamine and serotonin levels (Davidson & others, 2009). Regardless, Buspar relieves anxiety while allowing the individual to maintain normal alertness. It does not cause the drowsiness, sedation, and cognitive impairment that are associated with the benzodiazepines. And Buspar seems to have a very low risk of dependency and physical addiction.

TABLE 15.3

Antianxiety Medications

	Generic Name	Trade Name
Benzodiazepines	Diazepam	Valium
	Chlordiazepoxide	Librium
	Lorazepam	Ativan
	Triazolam	Halcion
	Alprazolam	Xanax
Non-benzodiazepine	Buspirone	Buspar

Source: Based on Julien (2012)

Paul Knight/Alamy

However, Buspar has one major drawback: It must be taken for two to three *weeks* before anxiety is reduced. While this decreases Buspar's potential for abuse, it also decreases its effectiveness for treating acute anxiety. For immediate, short-term relief from anxiety, the benzodiazepines are still regarded as the most effective medications currently available.

Lithium

In Chapter 14, on psychological disorders, we described *bipolar disorder,* previously known as *manic depression.* The medication most commonly used to treat bipolar disorder is **lithium,** a naturally occurring substance. Lithium counteracts both manic and depressive symptoms in bipolar patients (Nivoli & others, 2010). Its effectiveness in treating bipolar disorder has been well established since the 1960s (Preston & others, 2008).



Corbis

Lithium Water Lithium salt, a naturally occurring substance, was used in many over-the-counter medicines before it was discovered to be helpful in the treatment of mania. As this late-nineteenth-century ad shows, small amounts of lithium salt were also added to bottled water. An early version of the soft drink 7-Up included small amounts of lithium (Maxmen & Ward, 1995). Marketed as "lithium soda," the ad campaign claimed that it was the drink that took "the ouch out of the grouch!"

As a treatment for bipolar disorder, lithium can prevent acute manic episodes over the course of a week or two. Once an acute manic episode is under control, the long-term use of lithium can help prevent relapses into either mania or depression. The majority of patients with bipolar disorder respond well to lithium therapy. However, lithium doesn't help everyone. Some people on lithium therapy experience relapses (Nierenberg & others, 2007).

Like all other medications, lithium has potential side effects. If the lithium level is too low, manic symptoms persist. If it is too high, lithium poisoning may occur, with symptoms such as vomiting, muscle weakness, and reduced muscle coordination. Consequently, the patient's lithium blood level must be carefully monitored.

How lithium works was once a complete mystery. Lithium's action was especially puzzling because it prevented mood disturbances at both ends of the emotional spectrum—mania *and* depression. It turns out that lithium affects levels of an excitatory neurotransmitter called *glutamate,* which is found in many areas of the brain. Apparently, lithium stabilizes the availability of glutamate within a narrow, normal range, preventing both abnormal highs and abnormal lows (Keck & McElroy, 2009).

Bipolar disorder can also be treated with an anticonvulsant medicine called *Depakote.* Originally used to prevent epileptic seizures, Depakote seems to be especially helpful in treating those who rapidly cycle through bouts of bipolar disorder several times a year. It's also useful for treating bipolar patients who do not respond to lithium (Davis & others, 2005).

atypical antipsychotic medications Newer antipsychotic medications that, in contrast to the early antipsychotic drugs, block dopamine receptors in brain regions associated with psychotic symptoms rather than more globally throughout the brain, resulting in fewer side effects.

antianxiety medications Prescription drugs that are used to alleviate the symptoms of anxiety.

lithium A naturally occurring substance that is used in the treatment of bipolar disorder.

TABLE 15.8

Antidepressant Medications

	Generic Name	Trade Name
First-Generation Antidepressants		
Tricyclic antidepressants	Imipramine	Tofranil
	Desipramine	Norpramin
	Amitriptyline	Elavil
MAO inhibitors	Phenelzine	Nardil
	Tranylcypromine	Parnate
Second-Generation Antidepressants	Trazodone	Desyrel
	Bupropion	Wellbutrin
Selective Serotonin Reuptake Inhibitors (SSRIs)	Fluoxetine	Prozac
	Sertraline	Zoloft
	Paroxetine	Paxil
	Fluvoxamine	Luvox
	Citalopram	Celexa
	Escitalopram	Lexapro
Dual-Action Antidepressants	Nefazodone	Serzone
	Mirtazapine	Remeron
Dual-Reuptake Inhibitors	Venlafaxine	Effexor
	Duloxetine	Cymbalta

Source: Based on Julien (2012).

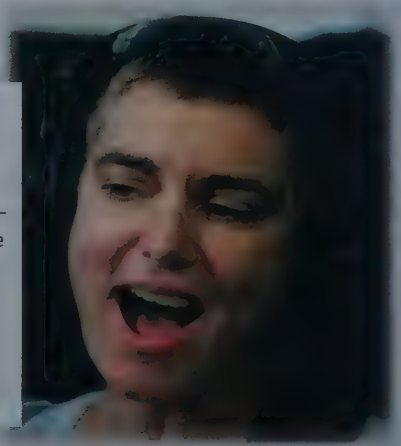
Antidepressant Medications

The **antidepressant medications** counteract the classic symptoms of depression—hopelessness, guilt, dejection, suicidal thoughts, difficulty concentrating, and disruptions in sleep, energy, appetite, and sexual desire. The first generation of antidepressants consists of two classes of drugs, called *tricyclics* and *MAO inhibitors* (see Table 15.9). Tricyclics and MAO inhibitors affect multiple neurotransmitter pathways in the brain. Evidence suggests that these medications alleviate depression by increasing the availability of two key brain neurotransmitters, *norepinephrine* and *serotonin*. However, even though brain levels of norepinephrine and serotonin begin to rise within *hours* of taking a tricyclic or MAO inhibitor, it can take up to six *weeks* before depressive symptoms begin to lift (Thase & Denko, 2008).

Tricyclics and MAO inhibitors can be effective in reducing depressive symptoms, but they can also produce numerous side effects (Holsboer, 2009). Tricyclics can cause weight gain, dizziness, dry mouth and eyes, and sedation. And, because tricyclics affect the cardiovascular system, an overdose can be fatal. As for the MAO inhibitors, they can interact with a chemical found in many foods, including cheese, smoked meats, and red wine. Eating these foods while taking an MAO inhibitor can result in dangerously high blood pressure, leading to stroke or even death.

The search for antidepressants with fewer side effects led to the development of the second generation of antidepressants. Second-generation antidepressants include *trazodone* and *bupropion*. Although chemically different from the tricyclics, the second-generation antidepressants were generally no more effective than the first-generation ones, and they turned out to have many of the same side effects.

In 1987, the picture changed dramatically with the introduction of a third group of antidepressants, the **selective serotonin reuptake inhibitors,** abbreviated **SSRIs.** Rather than acting on multiple neurotransmitter pathways, the SSRIs primarily affect the availability of a single neurotransmitter—serotonin. Compared with the earlier antidepressants, the new antidepressants act much more selectively in targeting specific serotonin pathways in the brain. The first SSRI to be released was *fluoxetine,* which is better known by its trade name, *Prozac*. Prozac was quickly followed by its chemical cousins, *Zoloft* and *Paxil*.



AP Photo/Richard Drew

Medication and Mood Disorders: Sinead O'Connor Medication can produce serious side effects and doesn't help everyone who suffers from depression or bipolar disorder. But for some, medication can be a lifesaver. Controversial Irish singer Sinead O'Connor suffered from depression in her twenties, attempted suicide in her early thirties, and was finally diagnosed with bipolar disorder in her late thirties. "The best way I can describe it to you is you're so sad, just terribly sad, that you're like a bucket of water with holes in it. Every pore of you is crying and you don't even understand why or what," O'Connor said. But after she began taking lithium and other medications, her moods and behavior stabilized. "I actually kind of died and got born again as a result of taking the meds and having a chance to, you know, build a life."

Prozac was specifically designed to alleviate depressive symptoms with fewer side effects than earlier antidepressants. It achieved that goal with considerable success. Although no more effective than tricyclics or MAO inhibitors, Prozac and the other SSRI antidepressants tend to produce fewer, and milder, side effects. But no medication is risk-free. Among Prozac's potential side effects are headaches, nervousness, difficulty sleeping, loss of appetite, and sexual dysfunction (Bresee & others, 2009). The SSRIs are also used in the treatment of anxiety disorders (Davidson & others, 2009).

Partly because of its relatively mild side-effects profile, Prozac quickly became very popular. By the early 1990s, an estimated *1 million prescriptions per month* were being written for Prozac. By the late 1990s, Prozac had become the best-selling antidepressant in the world. Today, Prozac is available in generic form, greatly reducing its cost. In 2010, sales of antidepressants surpassed $11 billion a year in the United States alone (Hayes, 2011).

Since the original SSRIs were released, several new antidepressants have been developed, including *Serzone* and *Remeron*. These antidepressants, called *dual-action antidepressants,* also affect serotonin levels, but their mechanism is somewhat different from that of the SSRIs. *Effexor* and *Cymbalta* belong to another class of antidepressants, called dual-reuptake inhibitors, that affect levels of both serotonin and norepinephrine. *Wellbutrin* is a dopamine-norepinephrine inhibitor that does not affect serotonin neurons (Julien, 2012).

With so many antidepressants available today, which should be prescribed? Certain factors, including previous attempts with antidepressants, possible interactions with other medications, and personal tolerance of side effects, often influence this decision. Currently, medications are typically prescribed on a "trial-and-error" basis—people are prescribed different drugs or combinations of drugs in different dosages until they find the regimen that works for them. Thus, patients may need to try multiple medications before finding an effective treatment.

Many researchers believe that genetic differences may explain why people respond so differently to antidepressants and other psychotropic medications (Crisafulli & others, 2011). The new field of *pharmacogenetics* is the study of how genes influence an individual's response to drugs (Nurnberger, 2009). As this field advances, it may help overcome the trial-and-error nature of prescribing not only antidepressants, but other psychotropic medications as well.

How do antidepressants and psychotherapy compare in their effectiveness? Several large-scale studies have found that both cognitive therapy and interpersonal therapy are just as effective as antidepressant medication in producing remission from depressive symptoms (Imel & others, 2008; Thase & others, 2007). Brain-imaging studies are just beginning to show how such treatments might change brain activity—a topic that we showcase in the Focus on Neuroscience box on the next page.

antidepressant medications Prescription drugs that are used to reduce the symptoms associated with depression.

selective serotonin reuptake inhibitors Class of antidepressant medications that increase the availability of serotonin in the brain and cause fewer side effects than earlier antidepressants; they include Prozac, Paxil, and Zoloft.



GOOD SHRINK, BAD SHRINK

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Jonathan Nourok/Stone/Getty Images

The Most Commonly Prescribed Class of Medication: Antidepressants

The number of people treated with antidepressant medication more than doubled from 13 million people in 1996 to 27 million people in 2005 (Olfson & Marcus, 2009). With the exception of African Americans, antidepressant usage increased in virtually every demographic group. Partially fueling the increase is the rise in the number of prescriptions written by physicians who do *not* give the patient a psychiatric diagnosis (Mojtabai & Olfson, 2011). In fact, people with depression are less likely to undergo psychotherapy treatment with a psychiatrist, psychologist, or other counselors (Mojtabai & Olfson, 2008). Ironically, although antidepressant usage has increased sharply, new studies suggest that antidepressants may not be as effective as pharmaceutical companies have claimed, especially for cases of mild depression (Fournier & others, 2010; Kirsch & others, 2008; Turner & others, 2008).

FOCUS ON NEUROSCIENCE

Comparing Psychotherapy and Antidepressant Medication

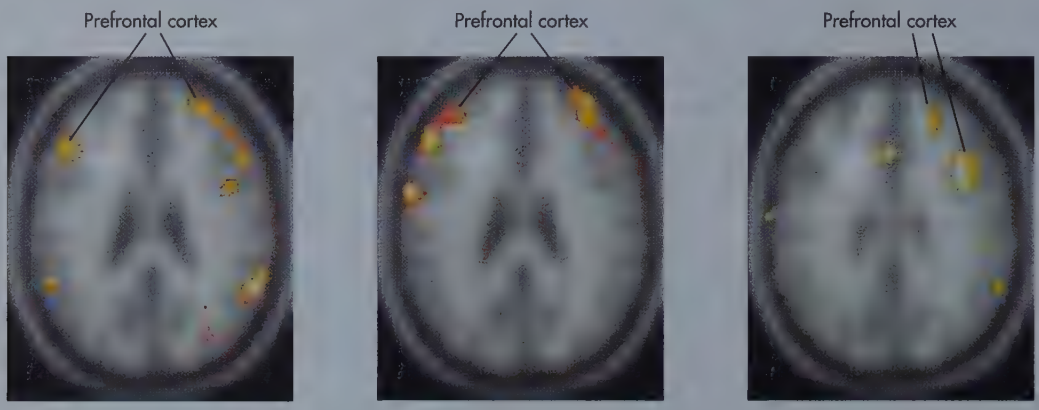
Both antidepressant medication and psychotherapy have been used to treat major depression. As we discussed in Chapter 14, major depression is characterized by a variety of physical symptoms, including changes in brain activity (Abler & others, 2007; Kempton & others, 2011). Antidepressants are assumed to work their effect by changing brain chemistry and activity. Does psychotherapy have the same effect?

In a recent study, PET scans were done on 24 people with major depression and compared to a matched group of normal control subjects who were *not* depressed (Brody & others, 2001). Compared with the nondepressed adults, the depressed individuals showed increased activity in three areas of the brain: the *prefrontal cortex*, the *caudate nucleus*, and the *thalamus*. The day after the first scan, 10 of the 24 depressed individuals started taking the antidepressant Paxil, an SSRI. The remaining 14 individuals with depression started interpersonal therapy (discussed earlier in this chapter), a psychodynamic therapy that has been shown to be effective in the treatment of depression. Twelve weeks after beginning treatment, the participants' depressive symptoms were measured, and all 24 study participants underwent PET scans again.

Following *either* treatment, patients' depressive symptoms improved. And the PET scans revealed that patients in *both* groups showed a trend toward more normalized brain functioning. Activity declined significantly in brain regions that had shown abnormally high activity before treatment began.

The PET scans shown here depict changes in the prefrontal cortex, one of the regions that showed a significant change toward more normal metabolic levels. Scan **(a)** shows activity levels in the prefrontal cortex before treatment. Scans **(b)** and **(c)** show the metabolic *decrease* in activity following treatment with Paxil **(b)** or interpersonal therapy **(c)**. In this comparison, note that **(b)** and **(c)** show the amount of change from the baseline condition, rather than the actual level of metabolic activity.

As these findings emphasize, *both* psychotherapy and antidepressant medication affect brain chemistry and functioning. Later studies showed that interpersonal therapy, cognitive behavior therapy, and antidepressants also produce distinct patterns of brain activity changes in people whose depressive symptoms have improved (Kennedy & others, 2007; Roffman & others, 2005). Such effects are not limited to depression. Similar changes toward a more normal pattern of brain functioning have also been found in people with panic disorder, post-traumatic stress disorder, obsessive compulsive disorder, phobias, and other anxiety disorders after psychotherapy treatment (Karlsson, 2011).



(a) Baseline—before treatment

(b) Decrease in activity after 12 weeks of treatment with Paxil

(c) Decrease in activity after 12 weeks of treatment with interpersonal therapy

Electroconvulsive Therapy

As we have just seen, millions of prescriptions are written for antidepressant medications in the United States every year. In contrast, a much smaller number of patients receive **electroconvulsive therapy,** or **ECT,** as a medical treatment for severe depression. Also known as *electroshock therapy* or *shock therapy,* electroconvulsive therapy involves using a brief burst of electric current to induce a seizure in the brain, much like an epileptic seizure. Although ECT is most commonly used to treat depression, it is occasionally used to treat mania, schizophrenia, and other severe mental disorders (Nahas & Anderson, 2011).

electroconvulsive therapy (ECT) A biomedical therapy used primarily in the treatment of depression that involves electrically inducing a brief brain seizure; also called *electroshock therapy.*

ECT is a relatively simple and quick medical procedure, usually performed in a hospital. The patient lies on a table. Electrodes are placed on one or both of the patient's

temples, and the patient is given a short-term, light anesthetic and muscle-relaxing drugs. To ensure adequate airflow, a breathing tube is sometimes placed in the patient's throat.

While the patient is unconscious, a split-second burst of electricity induces a seizure. The seizure lasts for about a minute. Outwardly, the seizure typically produces mild muscle tremors. After the anesthesia wears off and the patient wakes up, confusion and disorientation may be present for a few hours. Some patients experience a temporary or permanent memory loss for the events leading up to the treatment. To treat major depression, the patient typically receives two to three treatments per week for two to seven weeks, with less frequent follow-up treatments for several additional months (Fink, 2009).

In the short term, ECT is a very effective treatment for severe depression: About 80 percent of depressed patients improve (Rasmussen, 2009). ECT also relieves the symptoms of depression very quickly, typically within days. Because of its rapid therapeutic effects, ECT can be a lifesaving procedure for extremely suicidal or severely depressed patients (Nahas & Anderson, 2011). Such patients may not survive for the several weeks it takes for antidepressant drugs to alleviate symptoms.



Ethan Hyman/Raleigh News & Observer/Newscom

Electroconvulsive Therapy ECT is used as a treatment for major depression, especially in people who do not respond to antidepressant medications. During an ECT treatment, the person is given a short-acting anesthetic and muscle relaxants. A mild brain seizure, which lasts about a minute, is induced by a brief pulse of electricity. Although ECT can be an effective short-term treatment for people with major depression, the treatment effects tend to be short-lived. About half of the people who undergo ECT experience a relapse of the depression symptoms within a few months (Kellner & others, 2006; Tew & others, 2007).

Typically, ECT is used only after other forms of treatment, including both psychotherapy and medication, have failed to help the patient, especially when depression is severe. For some people, such as elderly individuals, ECT may be less dangerous than antidepressant drugs. In general, the complication rate from ECT is very low.

Nevertheless, inducing a brain seizure is not a matter to be taken lightly. ECT has potential dangers. Serious cognitive impairments can occur, such as extensive amnesia and disturbances in language and verbal abilities. However, fears that ECT might produce brain damage have not been confirmed by research (Eschweiler, 2007; McDonald & others, 2009).

Perhaps ECT's biggest drawback is that its antidepressive effects can be short-lived. Relapses within four months are relatively common (Glass, 2001). About half the patients treated for major depression experience a relapse within six months. Today, patients are often treated with long-term antidepressant medication following ECT, which reduces the relapse rate (McCall & others, 2011). In cases of severe, recurrent depression, ECT may also be periodically readministered to prevent the return of depressive symptoms.

At this point, you may be wondering why ECT is not in wider use. The reason is that ECT is the most controversial medical treatment for psychological disorders (Shorter, 2009). Not everyone agrees that ECT is either safe or effective.

Some have been quite outspoken against it, arguing that its safety and effectiveness are not as great as its supporters have claimed (Andre, 2009). The controversy over ECT is tied to its portrayal in popular media over time. The use of ECT declined drastically in the 1960s and 1970s when it was depicted in many popular books and movies, including *One Flew Over the Cuckoo's Nest*, as a brutal treatment with debilitating side effects (Swartz, 2009). Its use has increased greatly since that time, especially in the past decade or two, with ECT now available in most major metropolitan areas in the United States (Shorter, 2009).

How does ECT work? Despite many decades of research, it's still not known exactly why electrically inducing a convulsion relieves the symptoms of depression (Michael, 2009). One theory is that ECT seizures may somehow "reboot" the brain by depleting and then replacing important neurotransmitters (Swartz, 2009).

Some new, experimental treatments suggest that those seizures may not actually be necessary. That is, it may be possible to provide lower levels of electrical current to the brain than traditional ECT delivers and still reduce severe symptoms of depression and other mental illnesses. For example, ***transcranial magnetic stimulation (TMS)*** involves stimulation of certain regions of the brain with magnetic pulses of various frequencies. Unlike ECT, it requires no anesthetic, induces no seizures, and can be conducted in a private doctor's office rather than a hospital (Rosenberg & Dannon, 2009).

Another experimental treatment, *vagus nerve stimulation (VNS)*, involves the surgical implantation of a device about the size of a pacemaker into the left chest wall. The device provides brief, intermittent electrical stimulation to the left vagus nerve, which runs through the neck and connects to the brain stem (McClintock & others, 2009). Finally, *deep brain stimulation (DBS)* utilizes electrodes surgically implanted in the brain and a battery-powered neurostimulator surgically implanted in the chest. Wires under the skin connect the two implants, and the neurostimulator sends electrical signals to the brain (Fink, 2009; Schlapfer & Bewernick, 2009).

Keep in mind that TMS, VNS, and DBS are still experimental. And like ECT, the specific mechanism by which they may work is not entirely clear. Still, researchers are hopeful that these techniques will provide another viable treatment option for people suffering from severe psychological symptoms (McDonald & others, 2009).

CONCEPT REVIEW 15.3

Biomedical Therapies

Match each description below with one of the following treatments: (a) atypical antipsychotic medications, (b) antipsychotic medications, (c) antidepressant medications, (d) ECT, (e) antianxiety medications, (f) lithium.

_____ 1. Controversial biomedical therapy that induces a brief brain seizure.

_____ 2. Used in the treatment of bipolar disorder.

_____ 3. Drugs that globally reduce dopamine levels in the brain.

_____ 4. Drugs that produce their effects by increasing brain levels of GABA.

_____ 5. Drugs that are effective in reducing positive and negative symptoms of schizophrenia.

_____ 6. A category of psychotropic drugs that includes SSRIs and MAO inhibitors.

_____ 7. Medication that stabilizes the availability of the neurotransmitter called glutamate.

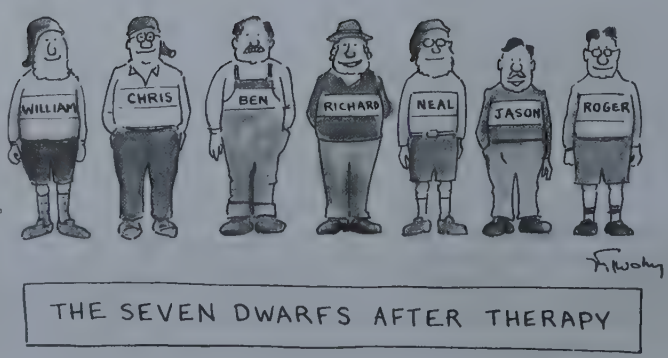


CLOSING THOUGHTS

As you've seen throughout this chapter, a wide range of therapies are available to help people who are troubled by psychological symptoms and disorders. Like our friend Marcia, whose story we told in the Prologue, many people benefit psychologically from psychotherapy. As the first part of the chapter showed, psychotherapy can help people by providing insight, developing more effective behaviors and coping strategies, and changing thought patterns.

The biomedical therapies, discussed in the second part of the chapter, can also help people with psychological problems. This was also true in Marcia's case, when she reluctantly agreed to try an antidepressant medication. For almost a year, Marcia took a low dose of one of the SSRI antidepressant medications. It helped in the short term, lessening the feelings of depression and anxiety and giving her time to work through various issues in therapy and develop greater psychological resilience. Today, people are increasingly being helped by a combination of psychotherapy and one of the psychotropic medications.

As our discussion of the effectiveness of psychotherapy has shown, characteristics of both the therapist and the client are important to the success of psychotherapy. In the Enhancing Well-Being with Psychology section at the end of this chapter, we describe the attitudes that should be brought to the therapeutic relationship, discuss some general ground rules of psychotherapy, and dispel some common misunderstandings. The Enhancing Well-Being with Psychology section will help you understand the nature of the therapeutic relationship and provide information useful to anyone who may be considering entering psychotherapy.



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ENHANCING WELL-BEING WITH PSYCHOLOGY

What to Expect in Psychotherapy

The cornerstone of psychotherapy is the relationship between the therapist and the person seeking help. But the therapy relationship is different from all other close relationships. On the one hand, the therapist–client relationship is characterized by intimacy and the disclosure of very private, personal experiences. On the other hand, there are distinct boundaries to the therapist–client relationship. To a therapy client, especially one who is undertaking psychotherapy for the first time, the therapy relationship may sometimes seem confusing and contradictory.

The following guidelines should help you understand the special nature of the therapy relationship and develop realistic expectations about the process of psychotherapy.

1. Strengthen your commitment to change.

Therapy is not about maintaining the status quo. It is about making changes in terms of how you think, feel, act, and respond. For many people, the idea of change produces mixed feelings. You can increase the likelihood of achieving your goals in therapy by thinking about the reasons you want to change and reminding yourself of your commitment to change (Hettema & others, 2005; Miller & Rose, 2009).

2. Therapy is a collaborative effort.

Don't expect your therapist to do all the work for you. If you are going to benefit from psychotherapy, you must actively participate in the therapeutic process. Often, therapy requires effort not only during the therapy sessions but also *outside* them. Many therapists assign "homework" to be completed between sessions. You may be asked to keep a diary of your thoughts and behaviors, read assigned material, rehearse skills that you've learned in therapy, and so forth. Such exercises are important components of the overall therapy process.

3. Don't confuse catharsis with change.

In the chapter Prologue, Marcia mentions the cathartic effect of therapy. *Catharsis* refers to the emotional release that people experience from the simple act of talking about their problems. Although it usually produces short-term emotional relief, catharsis in itself does not resolve the problem. Even so, catharsis is an important element of psychotherapy. Discussing emotionally charged issues with a therapist can lessen your sense of psychological tension and urgency, and can help you explore the problem more rationally and objectively.

4. Don't confuse insight with change.

Despite what you've seen in the movies, developing insight into the sources or nature of your psychological problems does not magically resolve them. Nor does insight automatically translate into healthier thoughts and behaviors. Instead, insight allows you to look at and understand your problems in a new light. The opportunity for change occurs when your therapist helps you use these insights to redefine past experiences, resolve psychological conflicts, and explore more adaptive forms of behavior. Even with the benefit of insight, it takes effort to change how you think, behave, and react to other people.

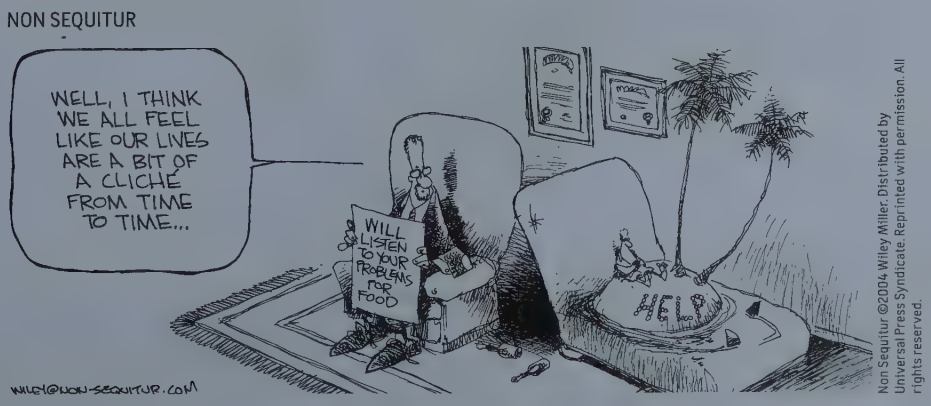
5. Don't expect your therapist to make decisions for you.

One of the most common misunderstandings about psychotherapy is that your therapist is going to tell you how to run your life. Not so. Virtually all forms of therapy are designed to increase a person's sense of responsibility, confidence, and mastery in dealing with life's problems. Your therapist won't make your decisions for you, but he or she *will* help you explore your feelings about important decisions—including ambivalence or fear. Some people find this frustrating because they want the therapist to tell them what to do. But if your therapist made decisions for you, it would only foster dependency and undermine your ability to be responsible for your own life.

6. Expect therapy to challenge how you think and act.

As you confront issues that you've never discussed before or even admitted to yourself, you may find therapy very anxiety-provoking. Moments of psychological discomfort are a normal, even expected, part of the therapy process.

Think of therapy as a psychological magnifying glass. Therapy tends to magnify both your strengths and your weaknesses. Such intense self-scrutiny is not always flattering. Examining how you habitually deal with failure and success, conflict and resolution, disappointment and joy can be disturbing. You may become aware of the psychological games you play or of how you use ego defense mechanisms to distort reality. You may have to acknowledge your own immature, maladaptive, or destructive behavior patterns. Although it can be painful, becoming aware that changes are needed is a necessary step toward developing healthier forms of thinking and behavior.



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7. Your therapist is not a substitute friend.

Unlike friendship, which is characterized by a mutual give-and-take, psychotherapy is focused solely on *you*. Rather than thinking of your therapist as a friend, think of him or her as an expert consultant—someone you've hired to help you deal better with your problems. The fact that your therapist is not socially or personally involved with you allows him or her to respond objectively and honestly. Part of what allows you to trust your therapist and "open up" emotionally is the knowledge that your therapist is ethically and legally bound to safeguard the confidentiality of what you say.

8. Therapeutic intimacy does not include sexual intimacy.

It's very common for clients to have strong feelings of affection, love, and even sexual attraction toward their therapists (Pope & Tabachnick, 1993). After all, the most effective therapists tend to be warm, empathic people who are genuinely caring and supportive (Beutler & others, 2004). However, *it is never ethical or appropriate for a therapist to have any form of sexual contact with a client.* There are *no* exceptions to that statement. Sexual contact between a therapist and a client violates the ethical standards of all mental health professionals.

How often does sexual contact occur? About 9 percent of male and 3 percent of female therapists admit that they have had sexual contact with clients (Pope & others, 2006).

Sexual involvement between client and therapist can be enormously damaging (Norris & others, 2003; Pope & others, 2006). Not only does it destroy the therapist's professional objectivity, but it also destroys the trust the client has invested in the therapist. When a therapist becomes sexually involved with a client, regardless of who initiated the sexual contact, the client is being exploited.

Rather than exploiting a client's feelings of sexual attraction, an ethical therapist will help the client understand and work through such feelings. Therapy should ultimately help you develop closer, more loving relationships with other people—but *not* with your therapist.

9. Don't expect change to happen overnight.

Change occurs in psychotherapy at different rates for different people. How quickly change occurs depends on many factors, such as the seriousness of your problems, the degree to which you are psychologically ready to make needed changes, and the therapist's skill in helping you implement those changes. As a general rule, most people make significant progress in a few months of weekly therapy sessions (Harnett & others, 2010). You can help create the climate for change by choosing a therapist you feel comfortable working with and by genuinely investing yourself in the therapy process.



CHAPTER REVIEW

Therapies

KEY POINTS

Introduction: Psychotherapy and Biomedical Therapy

- Psychological disorders can be treated with psychotherapy or biomedical therapy. **Psychotherapy** is based on the assumption that psychological factors play an important role in psychological disorders and symptoms. The **biomedical therapies** are based on the assumption that biological factors play an important role in psychological disorders and symptoms.

Psychoanalytic Therapy

- **Psychoanalysis** is a form of therapy developed by Sigmund Freud and is based on his theory of personality. The goal of psychoanalysis is to unearth repressed conflicts and resolve them in therapy.
- Psychoanalytic techniques and processes include **free association, resistance, dream interpretation, interpretation,** and **transference.** Traditional psychoanalysis involves an intense, long-term relationship between the patient and the psychoanalyst.
- **Short-term dynamic therapies** are based on psychoanalytic ideas but are more problem-focused and of shorter duration than traditional psychoanalysis. Therapists play a more directive role than traditional psychoanalysts, but they still use psychoanalytic techniques to help the patient resolve unconscious conflicts. **Interpersonal therapy (IPT)** is based on the premise that interpersonal problems are the cause of psychological disorders.

Humanistic Therapy

- **Client-centered therapy** was developed by Carl Rogers. Important aspects of client-centered therapy include a client who directs the focus of therapy sessions and a therapist who is genuine, demonstrates unconditional positive regard, and communicates empathic understanding. According to Rogers, clients change and grow when their self-concept becomes healthier as a result of these therapeutic conditions.
- Motivational interviewing is more directive than traditional client-centered therapy, and is designed to strengthen the client's self-motivation to change.

Behavior Therapy

- **Behavior therapy** assumes that maladaptive behaviors are learned and uses learning principles to directly change problem behaviors.
- Mary Cover Jones was the first behavior therapist, using the procedure of **counterconditioning** to extinguish phobic behavior in a child.
- Classical conditioning principles are involved in the use of **systematic desensitization** to treat phobias and **aversive conditioning** to treat harmful behaviors such as smoking and alcohol addiction.
- Operant conditioning techniques include using positive reinforcement for desired behaviors and extinction for undesired behaviors. The **token economy** represents the application of

operant conditioning to modify the behavior of groups of people who live in a hospital or other institution. Contingency management interventions are one application of the token economy, typically used in outpatient treatment. Virtual reality therapy is a computer-assisted form of systematic desensitization therapy, which has been effective in the treatment of phobias, post-traumatic stress disorder, social phobia, and panic disorder.

Cognitive Therapies

- The **cognitive therapies** are based on the assumption that psychological problems are caused by maladaptive patterns of thinking. Treatment focuses on changing unhealthy thinking patterns to healthier ones.
- **Rational-emotive therapy (RET)** was developed by Albert Ellis. RET focuses on changing the irrational thinking that is assumed to be the cause of emotional distress and psychological problems. Therapy involves identifying and challenging core irrational beliefs.
- **Cognitive therapy (CT)** was developed by Aaron T. Beck. CT is based on the assumption that psychological problems are caused by unrealistic and distorted thinking. Therapy involves teaching the client to recognize negative automatic thoughts and cognitive biases, and to empirically test the reality of the upsetting automatic thoughts.
- **Cognitive-behavioral therapy (CBT)** is based on the assumption that thoughts, moods, and behaviors are functionally interrelated. CBT combines cognitive and behavioral techniques in an integrated but flexible treatment plan. A new approach in CBT is the use of mindfulness techniques and the development of mindfulness-based therapies.

Group and Family Therapy

- **Group therapy** involves one or more therapists working with several people simultaneously. Group therapy has these advantages: It is cost-effective; therapists can observe clients interacting with other group members; clients benefit from the support, encouragement, and practical suggestions provided by other group members; and people can try out new behaviors in a safe, supportive environment.
- **Family therapy** focuses on the family rather than on the individual and is based on the assumption that the family is an interdependent system. Marital or couple therapy focuses on improving communication, problem-solving skills, and intimacy between members of a couple.

Evaluating the Effectiveness of Psychotherapy

- Meta-analysis has been used to combine the findings of many different studies on the effectiveness of psychotherapy. In general, psychotherapy has been shown to be significantly more effective than no treatment.
- Among the standard psychotherapies, no particular form of therapy is superior to the others. However, particular forms of therapy are more effective than others for treating some specific problems.
- Factors identified as crucial to therapy's effectiveness include the quality of the therapeutic relationship; the therapist's characteristics; the therapist's sensitivity to cultural differences; the client's characteristics; and supportive, stable external circumstances.
- Most psychotherapists today identify their orientation as **eclectic,** meaning that they integrate the techniques of more than one form of psychotherapy, tailoring their approach to the individual client's needs.

Biomedical Therapies

- The most common biomedical therapy is **psychotropic medications.**
- **Antipsychotic medications** include reserpine and chlorpromazine, which alter dopamine levels throughout the brain. Although these drugs reduce positive symptoms of schizophrenia, they have little effect on negative symptoms. Serious side effects can include the development of tardive dyskinesia after long-term use.
- The newer, second-generation **atypical antipsychotic medications** affect both serotonin and dopamine levels in the brain. The atypical antipsychotics have fewer side effects and more effectively treat the positive and negative symptoms of schizophrenia.
- **Antianxiety medications** include the benzodiazepines, such as diazepam (Valium). The benzodiazepines are effective in the treatment of anxiety but are potentially addictive and have many side effects. Buspirone (Buspar) is a newer antianxiety medication that has a low risk of abuse but takes a few weeks to become effective.
- **Lithium** effectively treats bipolar disorder by regulating glutamate levels in the brain. Depakote, an anticonvulsant, is also used to treat bipolar disorder.
- **Antidepressant medications** include the tricyclics, the MAO inhibitors, and the second-generation antidepressants. New antidepressants, including the **selective serotonin reuptake inhibitors (SSRIs),** the dual-action antidepressants, and the dual-reuptake inhibitors, tend to produce fewer side effects than the first- and second-generation antidepressants.
- **Electroconvulsive therapy (ECT),** which involves delivering a brief electric shock to the brain, is sometimes used in treating severe depression. The therapeutic effects of ECT tend to be short-lived, lasting no more than a few months. Partly because it is controversial, ECT is used far less frequently than antidepressant medication in the treatment of depression. Transcranial magnetic stimulation, vagus nerve stimulation, and deep brain stimulation are new, experimental brain stimulation treatments that show promise in treating depression and other mental disorders.

KEY TERMS

psychotherapy, p. 608
biomedical therapies, p. 608
psychoanalysis, p. 610
free association, p. 610
resistance, p. 610
dream interpretation, p. 611
interpretation, p. 611
transference, p. 611
short-term dynamic therapies, p. 612
interpersonal therapy (IPT), p. 612
client-centered therapy, p. 613
behavior therapy, p. 616
counterconditioning, p. 616
systematic desensitization, p. 617
aversive conditioning, p. 619
token economy, p. 620
cognitive therapies, p. 620
rational-emotive therapy (RET), p. 621
cognitive therapy (CT), p. 623
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psychotropic medications, p. 636
antipsychotic medications, p. 636
atypical antipsychotic medications, p. 638
antianxiety medications, p. 638
lithium, p. 639
antidepressant medications, p. 640
selective serotonin reuptake inhibitors (SSRIs), p. 640
electroconvulsive therapy (ECT), p. 642

KEY PEOPLE

Aaron T. Beck (b. 1921) American psychiatrist who founded cognitive therapy (CT), a psychotherapy based on the assumption that depression and other psychological problems are caused by biased perceptions, distorted thinking, and inaccurate beliefs. (p. 623)

Albert Ellis (b. 1913) American psychologist who founded the cognitive psychotherapy called rational-emotive therapy (RET), which emphasizes recognizing and changing irrational beliefs. (p. 621)

Sigmund Freud (1856–1939) Austrian physician and founder of psychoanalysis who theorized that psychological symptoms are the result of unconscious and unresolved conflicts stemming from early childhood (also see Chapter 11). (p. 610)

Mary Cover Jones (1896–1987) American psychologist who conducted the first clinical demonstrations of behavior therapy. (p. 616)

Carl Rogers (1902–1987) American psychologist who helped found humanistic psychology and developed client-centered therapy (also see Chapter 11). (p. 613)

CONCEPT REVIEW ANSWERS

15.1 page 628

1. d 2. b 3. e 4. c 5. a

15.2 page 635

1. False. Meta-analysis is a statistical technique used to combine and analyze the results of multiple studies on the same topic or issue.
2. False. Psychotherapy is significantly more effective than no treatment.
3. False. In general, there is little or no difference in the effectiveness of the different forms of empirically supported psychotherapy.
4. False. For psychotherapy to be effective, psychotherapists must be sensitive to cultural differences.
5. True
6. False. The client's willingness to change and his or her attitude toward therapy is essential to psychotherapy's success.

15.3 page 644

1. d 2. f 3. b 4. e 5. a 6. c 7. f



Web Companion Review Activities

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The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.

APPENDIX A

Statistics: Understanding Data

Marie D. Thomas, *California State University, San Marcos*

The Tables Are Turned: A Psychologist Becomes a Research Subject

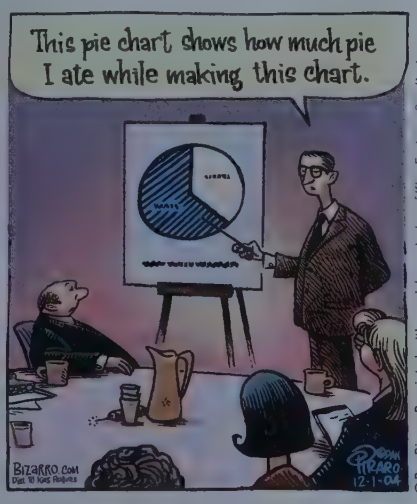
IN THIS APPENDIX:

Descriptive Statistics
Inferential Statistics
Endnote

PROLOGUE

FOR 12 MONTHS I WAS a participant in a research project that was designed to compare the effects of "traditional" and "alternative" diet, exercise, and stress-reduction programs (Riegel & others, 1996). Volunteers who were randomly assigned to the *traditional* program were taught to eat a high-fiber, low-fat diet; do regular aerobic exercise; and practice a progressive muscle relaxation technique. Participants who were randomly assigned to the *alternative* program received instruction in yoga and in a meditation technique, along with a diet based on body type and tastes. I was randomly assigned to the *no-treatment* control group, which was monitored throughout the year for weight and general health but received no diet, exercise, or stress-reduction intervention.

The participants in the study were drawn from a large medical group. Invitations to participate in the study were sent to 15,000 members of the medical group. Out of that initial pool, 124 volunteers were recruited, and about 40 were randomly selected for each group—the *traditional, alternative,* and *no-treatment control groups.* The participants included men and women between the ages of 20 and 56. A total of 88 subjects lasted the full year. The researchers were pleased that so many of us stayed with the project; it isn't easy to get people to commit to a year-long study!



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Data collection began even before participants found out the group to which they had been randomly assigned. We were mailed a thick packet of questionnaires covering a wide range of topics. One questionnaire asked about our current health status, use of prescription and over-the-counter medications, use of vitamins, and visits to both physicians and alternative health care practitioners. Another questionnaire focused on self-perceptions of health and well-being. Here we rated our mood, energy level,

physical symptoms, and health in general. A lifestyle survey requested information about diet (how often did we eat red meat? how many servings of fruits and vegetables did we consume a day?), exercise (how many times per week did we do aerobic exercise?), and behavior (such as cigarette smoking and consumption of alcoholic beverages). The lifestyle survey also assessed psychological variables such as levels of stress and happiness and how well we felt we were coping.

At our first meeting with the researchers, we handed in the questionnaires and were told which of the three groups we had been assigned to. We returned early the next morning to have our blood pressure and weight measured and to have blood drawn for tests of our levels of cholesterol, triglycerides, and glucose. The two intervention groups also received a weekend of training in their respective programs. In addition to daily practice of the techniques they had been taught, people in the *traditional* and *alternative* groups were expected to maintain a "compliance diary"—a daily record of their exercise, diet, and relaxation/meditation activities. The purpose of this diary was to determine whether health outcomes were better for people who practiced the techniques regularly. At first I was disappointed when I was randomly assigned to the control group because I was especially interested in learning the alternative techniques. However, I was relieved later when I found out how much detailed record keeping the intervention groups had to do!

The researchers accumulated even more data over the year-long period. Every 3 months, our blood pressure and weight were measured. At 6 and 12 months, the researchers performed blood tests and asked us to fill out questionnaires identical to those we'd completed at the beginning of the project.

The study included many variables. The most important independent variable (the variable that the researcher manipulates) was group assignment: *traditional* program, *alternative* program, or *no-treatment* control. The dependent variables (variables that are not directly manipulated by the researcher but that may change in response to manipulations of the independent variable) included weight, blood pressure, cholesterol level, self-perceptions regarding health, and mood. Since the dependent variables were measured several times, the researchers could study changes in them over the course of the year.

This study can help to answer important questions about the kinds of programs that tend to promote health. But the purpose of describing it here is not just to tell you whether the two intervention programs were effective and whether one worked better than the other. In the next couple of sections, I will use this study to help explain how researchers use **statistics** to (1) summarize the data they have collected and (2) draw conclusions about the data. The job of assessing what conclusions can be drawn from the research findings is the domain of *inferential statistics,* which I'll discuss later in this appendix. We'll begin by exploring how research findings can be summarized in ways that are brief yet meaningful and easy to understand. For this, researchers use descriptive statistics.



Descriptive Statistics

The study of programs to promote health generated a large amount of data. How did the researchers make sense of such a mass of information? How did they summarize it in meaningful ways? The answer lies in descriptive statistics. **Descriptive statistics** do just what their name suggests—they describe data. There are many ways to describe information. This appendix will examine four of the most common: frequency distributions, measures of central tendency, measures of variability, and measures of relationships. Since I don't have access to all the data that the health-promotion researchers gathered, I'll use hypothetical numbers to illustrate these statistical concepts.

Frequency Distribution

Suppose that at the start of the health-promotion study 30 people in the *traditional group reported getting the following number of hours of aerobic exercise each week:*

2, 5, 0, 1, 2, 2, 7, 0, 6, 2, 3, 1, 4, 5, 2,
1, 1, 3, 2, 1, 0, 4, 2, 3, 0, 1, 2, 3, 4, 1

Even with only 30 cases, it is difficult to make much sense of these data. Researchers need a way to organize such *raw scores* so that the information makes sense at a glance. One way to organize the data is to determine how many participants reported

■ **statistics** A branch of mathematics used by researchers to organize, summarize, and interpret data.

■ **descriptive statistics** Mathematical methods used to organize and summarize data.

exercising zero hours per week, how many reported exercising one hour, and so on, until all the reported amounts are accounted for. If the data were put into a table, the table would look like Table A.1.

This table is one way of presenting a **frequency distribution**—a summary of how often various scores occur. Categories are set up (in this case, the number of hours of aerobic exercise per week), and occurrences of each category are tallied to give the frequency of each one.

What information can be gathered from this frequency distribution table? We know immediately that most of the participants did aerobic exercise less than three hours per week. The number of hours per week peaked at two and declined steadily thereafter. According to the table, the most diligent exerciser worked out about an hour per day.

Some frequency distribution tables include an extra column that shows the percentage of cases in each category. For example, what percentage of participants reported two hours of aerobic exercise per week? The percentage is calculated by dividing the category frequency (8) by the total number of people (30), which yields about 27 percent.

While a table is good for summarizing data, it is often useful to present a frequency distribution visually, with graphs. One type of graph is the **histogram** (Figure A.1). A histogram is like a bar chart with two special features: The bars are always vertical, and they always touch. Categories (in our example, the number of hours of aerobic exercise per week) are placed on the *x*-axis (horizontal), and the *y*-axis (vertical) shows the frequency of each category. The resulting graph looks something like a city skyline, with buildings of different heights.

Another way of graphing the same data is with a **frequency polygon,** shown in Figure A.2 on the next page. A mark is made above each category at the point representing its frequency. These marks are then connected by straight lines. In our example, the polygon begins before the "0" category and ends at a category of "8," even though both of these categories have no cases in them. This is traditionally done so that the polygon is a closed figure.

Frequency polygons are good for showing the shape of a distribution. The polygon in Figure A.2 looks like a mountain, rising sharply over the first two

TABLE A.1

A Frequency Distribution Table

Hours of Aerobic Exercise per Week	Frequency
0	4
1	7
2	8
3	4
4	3
5	2
6	1
7	1
	30

A table like this is one way of presenting a frequency distribution. It shows at a glance that most of the people in our hypothetical group of 30 were not zealous exercisers before they began their traditional health-promotion program. Nearly two-thirds of them (19 people) engaged in vigorous exercise for two hours or less each week.

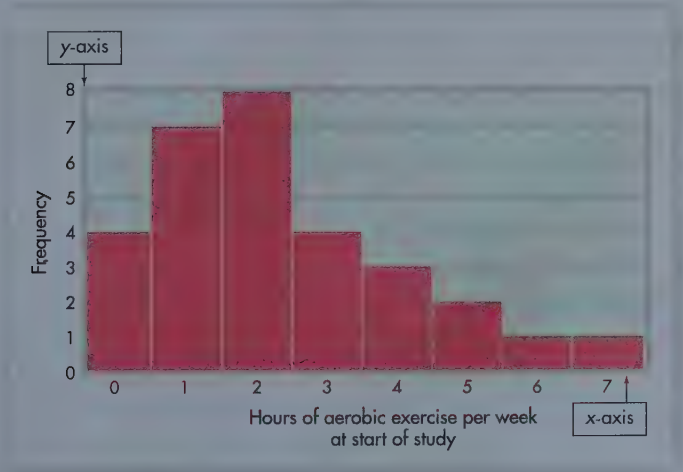


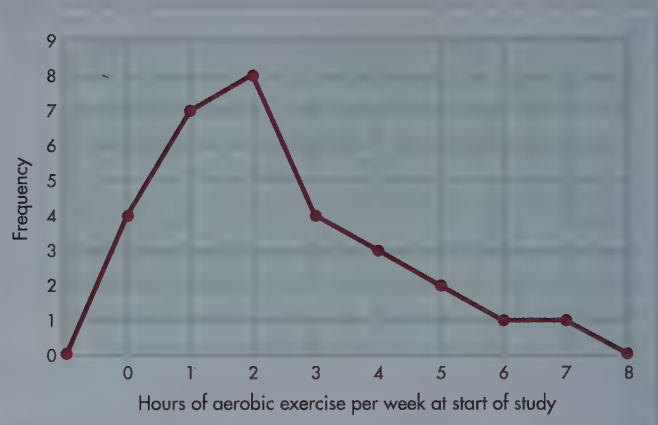
FIGURE A.1 A Histogram This histogram is another way of presenting the data given in Table A.1. Like the table, the histogram shows that most people do, at best, only a moderate amount of aerobic exercise (two hours or less each week). This is immediately clear from the fact that the highest bars on the chart are on the left, where the hours of exercise are lowest.

frequency distribution A summary of how often various scores occur in a sample of scores. Score values are arranged in order of magnitude, and the number of times each score occurs is recorded.

histogram A way of graphically representing a frequency distribution; a type of bar chart that uses vertical bars that touch.

frequency polygon A way of graphically representing a frequency distribution; frequency is marked above each score category on the graph's horizontal axis, and the marks are connected by straight lines.

FIGURE A.2 A Frequency Polygon (Positive Skew) Like Table A.1 and Figure A.1, this frequency polygon shows at a glance that the number of hours of aerobic exercise weekly is not great for most people. The high points come at one and two hours, which doesn't amount to much more than 10 or 15 minutes of exercise daily. An asymmetrical distribution like this one, which includes mostly low scores, is said to be positively skewed.



skewed distribution An asymmetrical distribution; more scores occur on one side of the distribution than on the other. In a *positively* skewed distribution, most of the scores are low scores; in a *negatively* skewed distribution, most of the scores are high scores.

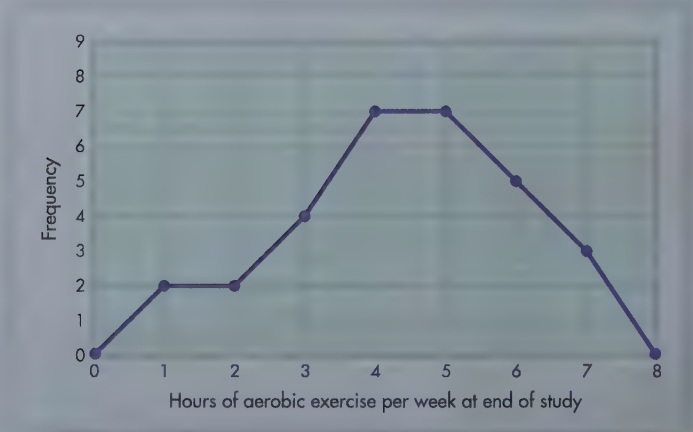
symmetrical distribution A distribution in which scores fall equally on both sides of the graph. The normal curve is an example of a symmetrical distribution.

categories, peaking at 2, and gradually diminishing from there. Such a distribution is asymmetrical, or a **skewed distribution,** meaning that if we drew a line through the middle of the *x*-axis (halfway between 3 and 4 hours), more scores would be piled up on one side of the line than on the other. More specifically, the polygon in Figure A.2 represents a *positively skewed* distribution, indicating that most people had low scores. A *negatively skewed* distribution would have mostly high scores, with fewer scores at the low end of the distribution. For example, if the traditional diet and exercise intervention worked, the 30 participants should, as a group, be exercising more at the end of the study than they had been at the beginning. Perhaps the distribution of hours of aerobic exercise per week at the end of the study would look something like Figure A.3—a distribution with a slight negative skew.

In contrast to skewed distributions, a **symmetrical distribution** is one in which scores fall equally on both halves of the graph. A special case of a symmetrical distribution, the normal curve, is discussed in a later section.

A useful feature of frequency polygons is that more than one distribution can be graphed on the same set of axes. For example, the end-of-study hours of aerobic exercise per week for the *traditional* and *alternative* groups could be compared on a single graph. Doing so would make it possible to see at a glance whether one group was exercising more than the other after a year of their respective programs.

FIGURE A.3 A Frequency Polygon (Negative Skew) When more scores fall at the high end of a distribution than at the low end, the distribution is said to be negatively skewed. We would expect a negatively skewed distribution if a health-promotion program worked and encouraged more hours of aerobic exercise. The more effective the program, the greater the skew.



By the way, Figure A.3 is actually a figment of my imagination. According to the diaries kept by the traditional- and alternative-program participants, compliance with the exercise portion of the program decreased over time. This does not necessarily mean that these subjects were exercising *less* at the end of the study than at the beginning, but they certainly did not keep up the program as it was taught to them. Compliance with the prescribed diets was steadier than compliance with exercise; compliance by the alternative group dropped between three months and six months, and then rose steadily over time. There was, however, one major difference between the two intervention groups in terms of compliance. Participants in the alternative group were more likely to be meditating at the end of the study than their traditional-group counterparts were to be practicing progressive relaxation.

Measures of Central Tendency

Frequency distributions can be used to organize a set of data and tell us how scores are generally distributed. But researchers often want to put this information into a more compact form. They want to be able to summarize a distribution with a single score that is "typical." To do this, they use a **measure of central tendency.**

measure of central tendency A single number that presents some information about the "center" of a frequency distribution.

mode The most frequently occurring score in a distribution.

median The score that divides a frequency distribution exactly in half so that the same number of scores lie on each side of it.

mean The sum of a set of scores in a distribution divided by the number of scores; the mean is usually the most representative measure of central tendency.

The Mode

The **mode** is the easiest measure of central tendency to calculate. The mode is simply the score or category that occurs most frequently in a set of raw scores or in a frequency distribution. The mode in the frequency distribution shown in Table A.1 is 2; more participants reported exercising two hours per week than any other category. In this example, the mode is an accurate representation of central tendency, but this is not always the case. In the distribution 1, 1, 1, 10, 20, 30, the mode is 1, yet half the scores are 10 and above. This type of distortion is the reason measures of central tendency other than the mode are needed.

The Median

Another way of describing central tendency is to determine the **median,** or the score that falls in the middle of a distribution. If the exercise scores were laid out from lowest to highest, they would look like this:

0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 4, 4, 4, 5, 5, 6, 7
↑

What would the middle score be? Since there are 30 scores, look for the point that divides the distribution in half, with 15 scores on each side of this point. The median can be found between the 15th and 16th scores (indicated by the arrow). In this distribution, the answer is easy: A score of 2 is the median as well as the mode.

The Mean

A problem with the mode and the median is that both measures reflect only one score in the distribution. For the mode, the score of importance is the most frequent one; for the median, it is the middle score. A better measure of central tendency is usually one that reflects *all* scores. For this reason, the most commonly used measure of central tendency is the **mean,** or arithmetic average. You have calculated the mean many times. It is computed by summing a set of scores and then dividing by the number of scores that went into the sum. In our example, adding together the exercise distribution scores gives a total of 70; the number of scores is 30, so 70 divided by 30 gives a mean of 2.33.

Formulas are used to express how a statistic is calculated. The formula for the mean is

$$\overline{X} = \frac{\Sigma X}{N}$$

In this formula, each letter and symbol has a specific meaning:

$\overline{X}$ is the symbol for the mean.

Σ is sigma, the Greek letter for capital *S,* and it stands for "sum." (Taking a course in statistics is one way to learn the Greek alphabet!)

X represents the scores in the distribution, so the numerator of the equation says, "Sum up all the scores."

N is the total number of scores in the distribution. Therefore, the formula says, "The mean equals the sum of all the scores divided by the total number of scores."

measure of variability A single number that presents information about the spread of scores in a distribution.

range A measure of variability; the highest score in a distribution minus the lowest score.

standard deviation A measure of variability; expressed as the square root of the sum of the squared deviations around the mean divided by the number of scores in the distribution.

Although the mean is usually the most representative measure of central tendency because each score in a distribution enters into its computation, it is particularly susceptible to the effect of extreme scores. Any unusually high or low score will pull the mean in its direction. Suppose, for example, that in our frequency distribution for aerobic exercise one exercise zealot worked out 70 hours per week. The mean number of aerobic exercise hours would jump from 2.33 to 4.43. This new mean is deceptively high, given that most of the scores in the distribution are 2 and below. Because of just that one extreme score, the mean has become less representative of the distribution. Frequency tables and graphs are important tools for helping us identify extreme scores *before* we start computing statistics.

Measures of Variability

In addition to identifying the central tendency in a distribution, researchers may want to know how much the scores in that distribution differ from one another. Are they grouped closely together or widely spread out? To answer this question, we need some **measure of variability.** Figure A.4 shows two distributions with the same mean but with different variability.

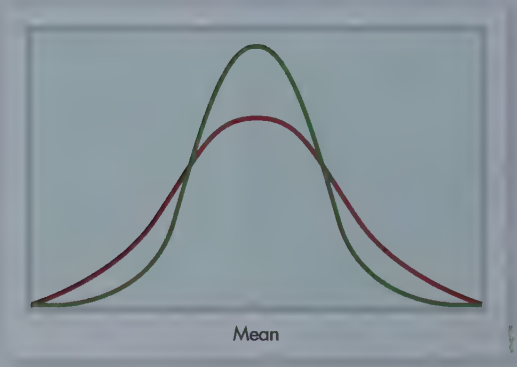


FIGURE A.4 Distributions with Different Variability
Two distributions with the same mean can have very different variability, or spread, as shown in these two curves. Notice how one is more spread out than the other; its scores are distributed more widely.

A simple way to measure variability is with the **range,** which is computed by subtracting the lowest score in the distribution from the highest score. Let's say that there are 15 participants in the traditional diet and exercise group and that their weights at the beginning of the study varied from a low of 95 pounds to a high of 155 pounds. The range of weights in this group would be 155 – 95 = 60 pounds.

As a measure of variability, the range provides a limited amount of information because it depends on only the two most extreme scores in a distribution (the highest and lowest scores). A more useful measure of variability would give some idea of the average amount of variation in a distribution. But variation from what? The most common way to measure variability is to determine how far scores in a distribution vary from the distribution's mean. We saw earlier that the mean is usually the best way to represent the "center" of the distribution, so the mean seems like an appropriate reference point.

What if we subtract the mean from each score in a distribution to get a general idea of how far each score is from the center? When the mean is subtracted from a score, the result is a *deviation* from the mean. Scores that are above the mean would have positive deviations, and scores that are below the mean would have negative deviations. To get an average deviation, we would need to sum the deviations and divide by the number of deviations that went into the sum. There is a problem with this procedure, however. If deviations from the mean are added together, the sum will be 0 because the negative and positive deviations will cancel each other out. In fact, the real definition of the mean is "the only point in a distribution where all the scores' deviations from it add up to 0."

We need to somehow "get rid of" the negative deviations. In mathematics, such a problem is solved by squaring. If a negative number is squared, it becomes positive. So instead of simply adding up the deviations and dividing by the number of scores (N), we first square each deviation, then add together the *squared* deviations and divide by N. Finally, we need to compensate for the squaring operation. To do this, we take the square root of the number just calculated. This leaves us with the **standard deviation.** The larger the standard deviation, the more spread out are the scores in a distribution.

TABLE A.2

Calculating the Standard Deviation

Weight X	Mean $\bar{X}$	Weight – Mean $X-\bar{X}$	(Weight – Mean) Squared $(X-\bar{X})^2$
155	124	31	961
149	124	25	625
142	124	18	324
138	124	14	196
134	124	10	100
131	124	7	49
127	124	3	9
125	124	1	1
120	124	−4	16
115	124	−9	81
112	124	−12	144
110	124	−14	196
105	124	−19	361
102	124	−22	484
95	124	−29	841
Sum (Σ) = 1,860		$\Sigma = 0$	$\Sigma = 4{,}388$
Mean ($\bar{X}$) = 124			

$$SD = \sqrt{\frac{\Sigma(x-\bar{x})^2}{N}} = \sqrt{\frac{4{,}388}{15}} = 17.10$$

To calculate the standard deviation, you simply add all the scores in a distribution (the left-hand column in this example) and divide by the total number of scores to get the mean. Then you subtract the mean from each score to get a list of deviations from the mean (third column). Next you square each deviation (fourth column), add the squared deviations together, divide by the total number of cases, and take the square root.

Let's look at an example to make this clearer. Table A.2 lists the hypothetical weights of the 15 participants in the traditional group at the beginning of the study. The mean, which is the sum of the weights divided by 15, is calculated to be 124 pounds, as shown at the bottom of the left-hand column. The first step in computing the standard deviation is to subtract the mean from each score, which gives that score's deviation from the mean. These deviations are listed in the third column of the table. The next step is to square each of the deviations (done in the fourth column), then add the squared deviations ($S = 4{,}388$) and divide that total by the number of participants ($N = 15$). Finally, we take the square root to obtain the standard deviation ($SD = 17.10$). The formula for the standard deviation (SD) incorporates these instructions:

$$SD = \sqrt{\frac{\Sigma(X-\bar{X})^2}{N}}$$

Notice that when scores have large deviations from the mean, the *standard deviation* is also large.

z Scores and the Normal Curve

The mean and the standard deviation provide useful descriptive information about an entire set of scores. But researchers can also describe the relative position of any individual score in a distribution. This is done by locating how far away from the

z score A number, expressed in standard deviation units, that shows a score's deviation from the mean.

standard normal curve or **standard normal distribution** A symmetrical distribution forming a bell-shaped curve in which the mean, median, and mode are all equal and fall in the exact middle.

mean the score is in terms of standard deviation units. A statistic called a ***z* score** gives us this information:

$$z = \frac{X - \overline{X}}{SD}$$

This equation says that to compute a *z* score, we subtract the mean from the score we are interested in (that is, we calculate its deviation from the mean) and divide this quantity by the standard deviation. A positive *z* score indicates that the score is above the mean, and a negative *z* score shows that the score is below the mean. The larger the *z* score, the farther away from the mean the score is.

Let's take an example from the distribution found in Table A.2. What is the *z* score of a weight of 149 pounds? To find out, you simply subtract the mean from 149 and divide by the standard deviation.

$$z = \frac{149 - 124}{17.10} = 1.46$$

A *z* score of +1.46 tells us that a person weighing 149 pounds falls about one and a half standard deviations above the mean. In contrast, a person weighing 115 pounds has a weight below the mean and would have a negative *z* score. If you calculate this *z* score, you will find it is –.53. This means that a weight of 115 is a little more than one-half a standard deviation below the mean.

Some variables, such as height, weight, and IQ, if graphed for large numbers of people, fall into a characteristic pattern. Figure A.5 shows this pattern, which is called the **standard normal curve** or the **standard normal distribution.** The normal curve is symmetrical (that is, if a line is drawn down its center, one side of the curve is a mirror image of the other side), and the mean, median, and mode fall exactly in the middle. The *x*-axis of Figure A.5 is marked off in standard deviation units, which, conveniently, are also *z* scores. Notice that most of the cases fall between –1 and +1 *SD*s, with the number of cases sharply tapering off at either end. This pattern is the reason the normal curve is often described as "bell shaped."

The great thing about the normal curve is that we know exactly what percentage of the distribution falls between any two points on the curve. Figure A.5 shows the percentages of cases between major standard deviation units. For example, 34.13 percent of the distribution falls between 0 and +1. That means that 84.13 percent of the distribution falls *below* one standard deviation (the 34.13 percent that is between 0 and +1, plus the 50 percent that falls below 0). A person who obtains a *z* score of +1 on some normally distributed variable has scored better than 84 percent of the other people in the distribution. If a variable is normally distributed (that is, if it has the standard bell-shaped pattern), a person's *z* score can tell us exactly where that person stands relative to everyone else in the distribution.

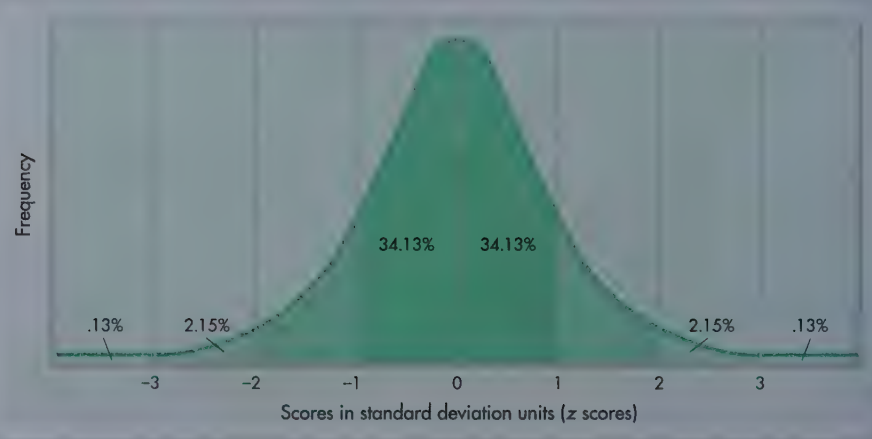


FIGURE A.5 The Standard Normal Curve The standard normal curve has several characteristics. Most apparent is its symmetrical bell shape. On such a curve, the mean, the median, and the mode all fall at the same point. But not every curve that is shaped roughly like a bell is a standard normal curve. With a normal curve, specific percentages of the distribution fall within each standard deviation unit from the mean. These percentages are shown on the graph.

Correlation

correlation The relationship between two variables.

correlation coefficient A numerical indication of the magnitude and direction of the relationship (the correlation) between two variables.

positive correlation A finding that two factors vary systematically in the same direction, increasing or decreasing in size together.

negative correlation A finding that two factors vary systematically in opposite directions, one increasing in size as the other decreases.

scatter diagram or **scatter plot** A graph that represents the relationship between two variables.

So far, the statistical techniques we've looked at focus on one variable at a time, such as hours of aerobic exercise weekly or pounds of weight. Other techniques allow us to look at the relationship, or **correlation,** between two variables. Statistically, the magnitude and direction of the relationship between two variables can be expressed by a single number called a **correlation coefficient.**

To compute a correlation coefficient, we need two sets of measurements from the same individuals or from pairs of people who are similar in some way. To take a simple example, let's determine the correlation between height (we'll call this the x variable) and weight (the y variable). We start by obtaining height and weight measurements for each individual in a group. The idea is to combine all these measurements into one number that expresses something about the relationship between the two variables, height and weight. However, we are immediately confronted with a problem: The two variables are measured in different ways. Height is measured in inches, and weight is measured in pounds. We need some way to place both variables on a single scale.

Think back to our discussion of the normal curve and z scores. What do z scores do? They take data of any form and put them into a standard scale. Remember, too, that a high score in a distribution always has a positive z score, and a low score in a distribution always has a negative z score. To compute a correlation coefficient, the data from both variables of interest can be converted to z scores. Therefore, each individual will have two z scores: one for height (the x variable) and one for weight (the y variable).

Then, to compute the correlation coefficient, each person's two z scores are multiplied together. All these "cross-products" are added up, and this sum is divided by the number of individuals. In other words, a correlation coefficient is the average (or mean) of the z-score cross-products of the two variables being studied:

$$\text{correlation coefficient} = \frac{\Sigma z_x z_y}{N}$$

A correlation coefficient can range from +1.00 to −1.00. The exact number provides two pieces of information: It tells us about the *magnitude* of the relationship being measured, and it tells us about its *direction*. The magnitude, or degree, of relationship is indicated by the size of the number. A number close to 1 (whether positive or negative) indicates a strong relationship, while a number close to 0 indicates a weak relationship. The sign (+ or −) of the correlation coefficient tells us about the relationship's direction.

A **positive correlation** means that as one variable increases in size, the second variable also increases. For example, height and weight are positively correlated: As height increases, weight tends to increase also. In terms of z scores, a positive correlation means that high z scores on one variable tend to be multiplied by high z scores on the other variable and that low z scores on one variable tend to be multiplied by low z scores on the other. Remember that just as two positive numbers multiplied together result in a positive number, so two negative numbers multiplied together also result in a positive number. When the cross-products are added together, the sum in both cases is positive.

A **negative correlation,** in contrast, means that two variables are *inversely* related. As one variable increases in size, the other variable decreases. For example, professors like to believe that the more hours students study, the fewer errors they will make on exams. In z-score language, high z scores (which are positive) on one variable (more hours of study) tend to be multiplied by low z scores (which are negative) on the other variable (fewer errors on exams), and vice versa, making negative cross-products. When the cross-products are summed and divided by the number of cases, the result is a negative correlation coefficient.

An easy way to show different correlations is with graphs. Plotting two variables together creates a **scatter diagram** or **scatter plot,** like the ones in Figures A.6, A.7, and A.8 on the next page. These figures show the relationship between complying with some component of the alternative health-promotion program and some other variable related to health. Although the figures describe relationships actually found in the study, I have made up the specific correlations to illustrate key points.



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FIGURE A.6 Scatter Plot of a Positive Correlation A correlation (or the lack of one) can be clearly shown on a scatter diagram. This one shows a moderately strong positive correlation between subjects' compliance with the yoga component of the alternative health-promotion program and their energy level. The positive direction of the correlation is indicated by the upward-sloping pattern of the dots, from bottom left to top right. This means that if one variable is high, the other tends to be high, too, and vice versa. That the strength of the relationship is only moderate is indicated by the fact that the data points (each indicating an individual subject's score) are not all positioned along a straight diagonal line.

Figure A.6 shows a moderately strong positive relationship between compliance with the yoga part of the alternative program and a person's energy level. You can see this just by looking at the pattern of the data points. They generally form a line running from lower left to upper right. When calculated, this particular correlation coefficient is +.59, which indicates a correlation roughly in the middle between 0 and +1.00. In other words, people who did more yoga tended to have higher energy levels. The "tended to" part is important. Some people who did not comply well with the yoga routine still had high energy levels, while the reverse was also true. A +1.00 correlation, or a *perfect* positive correlation, would indicate that frequent yoga sessions were *always* accompanied by high levels of energy, and vice versa. What would a scatter diagram of a perfect +1.00 correlation look like? It would be a straight diagonal line starting in the lower left-hand corner of the graph and progressing to the upper right-hand corner.

Several other positive correlations were found in this study. Compliance with the alternative diet was positively associated with increases in energy and positive health perceptions. In addition, following the high-fiber, low-fat traditional diet was associated with a higher level of coping and high vitamin intake.

The study also found some negative correlations. Figure A.7 illustrates a *negative* correlation between compliance with the meditation part of the alternative program and cigarette smoking. This correlation coefficient is −.77. Note that the data points fall in the opposite direction from those in Figure A.6, indicating that as the frequency of meditation increased, cigarette smoking decreased. The pattern of points in Figure A.7 is closer to a straight line than is the pattern of points in Figure A.6. A correlation of −.77 shows a relationship of greater magnitude than does a correlation of +.59. But though −.77 is a relatively high correlation, it is not a perfect relationship. A *perfect* negative relationship would be illustrated by a straight diagonal line starting in the upper left-hand corner of the graph and ending at the lower right-hand corner.

Finally, Figure A.8 shows two variables that are not related to each other. The hypothetical correlation coefficient between compliance with the aerobic exercise part of the traditional program and a person's level of coping is +.03, barely above 0. In the scatter diagram, data points fall randomly, with no general direction to them. From a *z*-score point of view, when two variables are not related, the cross-products are mixed—that is, some are positive and some are negative. Sometimes high *z* scores on one variable go with high *z* scores on the other, and low *z* scores on one variable go with low *z* scores on the other. In both cases, positive cross-products result.

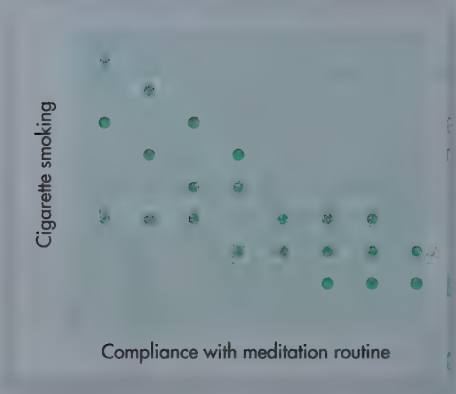


FIGURE A.7 Scatter Plot of a Negative Correlation In general, people who engage in meditation more often tend to smoke less. This negative correlation is indicated by the downward-sloping pattern of dots, from upper left to lower right. Because these dots are clustered somewhat closer together than those in Figure A.6, we can tell at a glance that the relationship here is somewhat stronger.

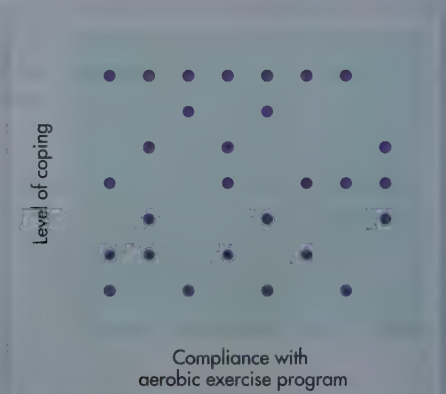


FIGURE A.8 Scatter Plot of No Correlation You may be surprised to learn that in this study, compliance with the aerobic exercise portion of the traditional program was not related to level of coping. This scatter diagram shows that lack of relationship. The points fall randomly, revealing no general direction or trend and thus indicating the absence of a correlation.

In other pairs of scores, high z scores on one variable go with low z scores on the other variable (and vice versa), producing negative cross-products. When the cross-products for the two variables are summed, the positive and negative numbers cancel each other out, resulting in a 0 (or close to 0) correlation.

In addition to describing the relationship between two variables, correlation coefficients are useful for another purpose: prediction. If we know a person's score on one of two related variables, we can predict how he or she will perform on the other variable. For example, in a recent issue of a magazine, I found a quiz to rate my risk of heart disease. I assigned myself points depending on my age, HDL ("good") and total cholesterol levels, systolic blood pressure, and other risk factors, such as cigarette smoking and diabetes. My total points (−2) indicated that I had less than a 1 percent risk of developing heart disease in the next five years. How could such a quiz be developed? Each of the factors I rated is correlated to some degree with heart disease. The older you are and the higher your cholesterol and blood pressure, the greater your chance of developing heart disease. Statistical techniques are used to determine the relative importance of each of these factors and to calculate the points that should be assigned to each level of a factor. Combining these factors provides a better prediction than any single factor because none of the individual risk factors correlate perfectly with the development of heart disease.

One thing you cannot conclude from a correlation coefficient is *causality*. In other words, the fact that two variables are highly correlated does not necessarily mean that one variable directly causes the other. Take the meditation and cigarette-smoking correlation. This negative correlation tells us that people in the study who diligently practiced meditation tended to smoke less than those who seldom meditated. Regular meditation may have had a direct effect on the desire to smoke cigarettes, but it is also possible that one or more other variables affected both meditation and smoking. For example, perhaps participation in the study convinced some people that they needed to change their lifestyles completely. Both compliance with the meditation routine and a decreased level of cigarette smoking may have been "caused" by this change in lifestyle. As discussed in Chapter 1, the *experimental method* is the only method that can provide compelling scientific evidence of a cause-and-effect relationship between two or more variables. Can you think of a way to test the hypothesis that regularly practicing meditation causes a reduction in the desire to smoke cigarettes?

Inferential Statistics

Let's say that the mean number of physical symptoms (like pain) experienced by the participants in each of the three groups was about the same at the beginning of the health-promotion study. A year later, the number of symptoms had decreased in the two intervention groups but had remained stable in the control group. This may or may not be a meaningful result. We would expect the average number of symptoms to be somewhat different for each of the three groups because each group consisted of different people. And we would expect some fluctuation in level over time, due simply to chance. But are the differences in number of symptoms between the intervention groups and the control group large enough *not* to be due to chance alone? If other researchers conducted the same study with different participants, would they be likely to get the same general pattern of results? To answer such questions, we turn to inferential statistics. **Inferential statistics** guide us in determining what inferences, or conclusions, can legitimately be drawn from a set of research findings.

Depending on the data, different inferential statistics can be used to answer questions such as the ones raised in the preceding paragraph. For example, ***t*-tests** are used to compare the means of two groups. Researchers could use a t-test, for instance, to compare average energy level at the end of the study in the traditional and alternative groups. Another t-test could compare the average energy level at the beginning and end of the study within the alternative group. If we wanted to compare the means of more than two groups, another technique, *analysis of variance* (often abbreviated as ANOVA), could

inferential statistics Mathematical methods used to determine how likely it is that a study's outcome is due to chance and whether the outcome can be legitimately generalized to a larger population.

***t*-test** Test used to establish whether the means of two groups are statistically different from each other.

Type I error Erroneously concluding that study results are significant.

Type II error Failing to find a significant effect that does, in fact, exist.

be used. Each inferential statistic helps us determine how likely a particular finding is to have occurred as a matter of nothing more than chance or random variation. If the inferential statistic indicates that the odds of a particular finding occurring are considerably greater than mere chance, we can conclude that our results are *statistically significant.* In other words, we can conclude with a high degree of confidence that the manipulation of the independent variable, rather than simply chance, is the reason for the results.

To see how this works, let's go back to the normal curve for a moment. Remember that we know exactly what percentage of a normal curve falls between any two *z* scores. If we choose one person at random out of a normal distribution, what is the chance that this person's *z* score is above +2? If you look at Figure A.9 (it's the same as Figure A.5), you will see that 2.28 percent of the curve lies above a *z* score (or standard deviation unit) of +2. Therefore, the chance, or *probability,* that the person we choose will have a *z* score above +2 is .0228 (or 2.28 chances out of 100). That's a pretty small chance. If you study the normal curve, you will see that the majority of cases (95.44 percent of the cases, to be exact) fall between –2 and +2 *SD*s, so in choosing a person at random, that person is not likely to fall above a *z* score of +2.

When researchers test for statistical significance, they usually employ statistics other than *z* scores, and they may use distributions that differ in shape from the normal curve. The logic, however, is the same. They compute some kind of inferential statistic that they compare to the appropriate distribution. This comparison tells them the likelihood of obtaining their results if chance alone is operating.

The problem is that no test exists that will tell us for sure whether our intervention or manipulation "worked"; we always have to deal with probabilities, not certainties. Researchers have developed some conventions to guide them in their decisions about whether or not their study results are statistically significant. Generally, when the probability of obtaining a particular result if random factors alone are operating is less than .05 (5 chances out of 100), the results are considered statistically significant. Researchers who want to be even more sure set their probability value at .01 (1 chance out of 100).

Because researchers deal with probabilities, there is a small but real possibility of *erroneously* concluding that study results are significant; this is called a **Type I error.** The results of one study, therefore, should never be completely trusted. For researchers to have greater confidence in a particular effect or result, the study should be repeated, or *replicated.* If the same results are obtained in different studies, then we can be more certain that our conclusions about a particular intervention or effect are correct.

There is a second decision error that can be made—a **Type II error.** This is when a researcher fails to find a significant effect, yet that significant effect really exists. A Type II error results when a study does not have enough *power;* in a sense, the study is not strong enough to find the effect the researcher is looking for. Higher power may be achieved by improving the research design and measuring instruments, or by increasing the number of participants or subjects being studied.

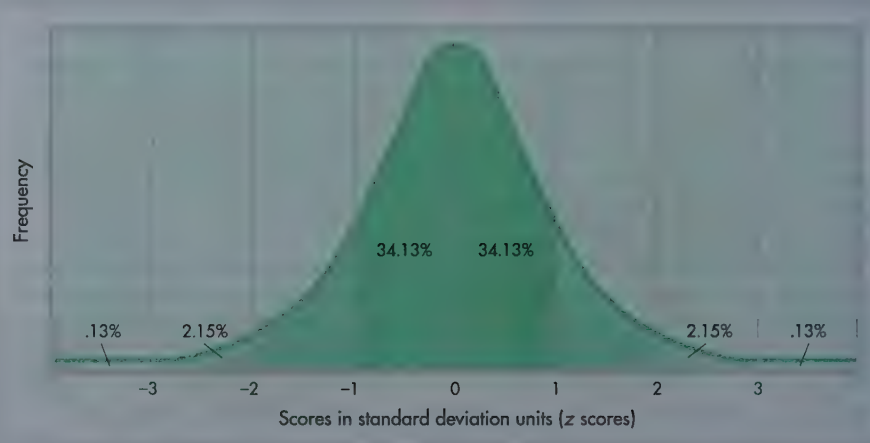


FIGURE A.9 The Standard Normal Curve

One final point about inferential statistics. Are the researchers interested only in the changes that might have occurred in the small groups of people participating in the health-promotion study, or do they really want to know whether the interventions would be effective for people in general? This question focuses on the difference between a population and a sample. A **population** is a complete set of something—people, nonhuman animals, objects, or events. The researchers who designed this study wanted to know whether the interventions they developed would benefit *all* people (or, more precisely, all people between the ages of 20 and 56). Obviously, they could not conduct a study on this entire population. The best they could do was choose some portion of that population to serve as subjects; in other words, they selected a **sample.** The study was conducted on this sample. The researchers analyzed the sample results, using inferential statistics to make guesses about what they would have found had they studied the entire population. Inferential statistics allow researchers to take the findings they obtain from a sample and apply them to a population.

- **population** A complete set of something—people, nonhuman animals, objects, or events.
- **sample** A subset of a population.

So what did the health-promotion study find? Did the interventions work? The answer is "yes," sort of. The traditional- and alternative-treatment groups, when combined, improved more than did the no-treatment control group. At the end of the study, participants in the two intervention programs had better self-perceptions regarding health, better mood, more energy, and fewer physical symptoms. Compared with the traditional and the no-treatment groups, the alternative group showed greater improvement in health perceptions and a significant decrease in depression and the use of prescription drugs. Interestingly, participation in the treatment groups did not generally result in changes in health risk, such as lowered blood pressure or decreased weight. The researchers believe that little change occurred because the people who volunteered for the study were basically healthy individuals. The study needs to be replicated with a less healthy sample. In sum, the intervention programs had a greater effect on health perceptions and psychological variables than on physical variables. The researchers concluded that a health-promotion regimen (either traditional or alternative) is helpful. I'm sure other studies will be conducted to explore these issues further!

Endnote

Although I briefly saw other study participants at each three-month data-collection point, I never spoke to anyone. The last measurement session, however, was also a celebration for our year-long participation in the project. Approximately 30 people attended my session, and participants from each of the three groups were present. After our blood was drawn and our blood pressure and weight readings were taken, we were treated to breakfast. Then one of the principal researchers *debriefed* us: She gave us some background on the study and told us what she hoped to learn. At this point, participants were given the opportunity to talk about how the study had affected their lives. It was fascinating to hear members of the intervention groups describe the changes they had made over the past year. One woman said that a year ago she could never imagine getting up early to meditate, yet now she looks forward to awakening each morning at 4:00 A.M. for her first meditation session. Other people described the modifications they had made in their diet and exercise patterns and how much better they felt. Although I did not experience either of the interventions, I know that simply being a subject in the study made me more conscious of what I ate and how much I exercised. This could have been a confounding factor; that is, it could have inadvertently changed my behavior even though I was in the control group. In fact, my weight decreased and my level of "good" cholesterol increased over the course of the year.

We were not paid for our participation in this study, but we received small gifts as tokens of the researchers' appreciation. In addition, we were all given the option of taking any or all of the intervention training at no cost (and some courses in alternative techniques could be quite expensive). The most important thing for me was the satisfaction of participation—the fact that I had stayed with the study for an entire year and, in a small way, had made a contribution to science.



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"It's my fervent hope, Fernbaugh, that these are meaningless statistics."

APPENDIX REVIEW

Statistics: Understanding Data

KEY POINTS

Descriptive Statistics

- **Statistics** is a branch of mathematics that researchers use to organize and interpret data.
- **Descriptive statistics** are summaries of data that make the data meaningful and easy to understand. One descriptive statistic is a **frequency distribution,** which can be presented in the form of a table, a **histogram,** or a **frequency polygon.** Some frequency distributions are positively **skewed;** that is, most of the scores in the distribution pile up at the low end. Distributions that are negatively skewed have mostly high scores. **Symmetrical distributions** have equal numbers of scores on both sides of the distribution's midpoint.
- The **mode,** the **median,** and the **mean** are **measures of central tendency** of a distribution. The mode is the most frequent score. The median is the middle score in the distribution. The mean is the arithmetic average. To calculate the mean, scores are summed and divided by the total number of scores. The mean is usually the best overall representation of central tendency, but it is strongly influenced by extremely high or extremely low scores.
- The **range** and **standard deviation** are **measures of variability** or spread of a distribution. The range is the highest score in the distribution minus the lowest score. The standard deviation is the square root of the average of the squared deviations from the mean.
- A ***z* score** expresses a single score's deviation from the mean of a distribution in standard deviation units.
- The **standard normal curve** is a symmetrical distribution forming a bell-shaped curve in which the mean, median, and mode are all equal and fall in the exact middle. The percentage of cases that fall between any two points on the normal curve is known. Over 95 percent of the cases fall between two standard deviations above the mean and two standard deviations below the mean.
- **Correlation** refers to the relationship between two variables. A **correlation coefficient** is a number that indicates the magnitude and direction of such a relationship. A correlation coefficient may range from −1 to +1. The closer the value is to −1 or +1, the stronger the relationship is. Correlations close to 0 indicate no relationship. A **positive correlation** coefficient tells us that as one variable increases in size, the second variable also increases. A **negative correlation** coefficient indicates that as one variable increases in size, the second variable decreases. A correlation relationship may be presented visually in a **scatter diagram.**
- Correlations enable us to predict the value of one variable from knowledge of another variable's value. However, a correlational relationship is not necessarily a causal relationship.

Inferential Statistics

- **Inferential statistics** are used to determine whether the outcomes of a study can be legitimately generalized to a larger population. A **population** is a complete set of something. A sample is a subset of a population. One technique is a ***t*-test,** which is used to compare the means of two groups.
- Inferential statistics provide information about the probability of a particular result if only chance or random factors are operating. If this probability is small, the findings are said to be statistically significant; that is, they are probably due to the researcher's interventions. Researchers must avoid making decision errors. Erroneously concluding that study results are significant is a **Type I error.** Failing to find a significant effect that does, in fact, exist is a **Type II error.**

KEY TERMS

statistics, p. A-2
descriptive statistics, p. A-2
frequency distribution, p. A-3
histogram, p. A-3
frequency polygon, p. A-3
skewed distribution, p. A-4
symmetrical distribution, p. A-4
measure of central tendency, p. A-5
mode, p. A-5
median, p. A-5
mean, p. A-5
measure of variability, p. A-6
range, p. A-6
standard deviation, p. A-6
z score, p. A-8
standard normal curve (standard normal distribution), p. A-8
correlation, p. A-9
correlation coefficient, p. A-9
positive correlation, p. A-9
negative correlation, p. A-9
scatter diagram (scatter plot), p. A-9
inferential statistics, p. A-11
t-test, p. A-11
Type I error, p. A-12
Type II error, p. A-12
population, p. A-13
sample, p. A-13

Web Companion Review Activities

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The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.

APPENDIX B

Industrial / Organizational Psychology

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IN THIS APPENDIX:

- What Is Industrial/Organizational Psychology?
- History of I/O Psychology
- Industrial (Personnel) Psychology
- Organizational Behavior
- Workplace Trends and Issues
- Employment Settings, Type of Training, Earnings, and Employment Outlook

IN THE POPULAR TELEVISION SITCOM *The Office*, Steve Carrell played Michael Scott, branch office manager of a fictitious paper company. Claiming to be "friend first, boss second," Michael taught viewers exactly what a manager should *not* say or do. In an episode about sexual harassment, for example, Michael reluctantly announced that he was giving up all non-work-related conversations and jokes, only to immediately lapse into coarse sexual innuendo. As a manager, Michael was incompetent, narcissistic, inconsiderate, and blatantly oblivious to any of his deficiencies.

Many of us recognize parts of this character at our own workplaces. And this is probably why the show has been so successful. Today's workplace is governed by standards, policies, rules, and laws—all of which Michael flouted on a daily basis. Leading others takes insight, passion, and know-how, none of which Michael possessed. Unfortunately, many managers receive little or no training about assessment, leadership, human relations, human motivation, and the like. Consequently they are often ill-equipped to be effective managers, just like our beloved Michael.



NBC/Photofest

Steve Carrell as Michael Scott in the television sitcom *The Office*.

Leadership development has been one of the greatest challenges in the world of industrial and organizational psychology (I/O). This field of psychology also helps build teams, streamline processes, increase job satisfaction, and transform workplace culture, among other objectives. This appendix will introduce you to the many benefits of bringing psychology to the workplace. So, Michael, listen up.

[1]Claudia Cochran-Miller and Marie Waung contributed equally to this appendix.

What Is Industrial/Organizational Psychology?

industrial/organizational (I/O) psychology The branch of psychology that focuses on the study of human behavior in the workplace.

personnel psychology A subarea of I/O psychology that focuses on matching people's characteristics to job requirements, accurately measuring job performance, and assessing employee training needs.

organizational behavior A subarea of I/O psychology that focuses on the workplace culture and its influence on employee behavior.

Industrial/organizational (I/O) psychology is the branch of psychology that focuses on the study of human behavior in the workplace. The "industrial," or "I," side of I/O psychology focuses on measuring human characteristics and matching those characteristics to particular jobs. This process involves applying psychological research findings to personnel functions such as pre-employment testing, placement, training and development, and performance management. This specialty, often called **personnel psychology,** helps companies attract, recruit, select, and train the best employees for the organization.

In contrast, the "organizational," or "O," side focuses on the workplace culture and its influence on employee behavior. Organizational psychology helps companies develop a culture that fulfills organizational goals while addressing employee needs. Organizational psychologists, then, apply psychological findings to areas such as leadership development, team building, motivation, ethics training, and wellness planning. The "O" side of I/O psychology is also called **organizational behavior.** In their research and work, I/O psychologists generally concentrate on the content areas described below:

1. **JOB ANALYSIS.** Job analysts must determine the duties of a particular position, as well as the personal characteristics that best match those duties.
2. **SELECTION AND PLACEMENT.** This area includes the development of assessment techniques to help select job applicants most likely to be successful in a given job or organization.
3. **TRAINING AND DEVELOPMENT.** Psychologists in this field may design customized training programs and evaluate the effectiveness of those programs.
4. **PERFORMANCE MANAGEMENT AND EVALUATION.** Companies are often concerned with ways to improve their performance evaluation systems. Performance management systems include teaching managers how to collect evaluation data, how to avoid evaluation errors, and how to communicate the results.
5. **ORGANIZATIONAL DEVELOPMENT.** The goal of organizational development (OD) is to bring about positive change in an organization, through assessment of the organizational social environment and culture.



Designing for People One subarea of industrial/organizational psychology is concerned with the human factors involved in the use of workplace procedures and equipment. For example, this factory's procedure for tightening bolts on the wheel of a log skidder requires the mechanic to kneel and heft a heavy wrench—a tiring, painful position. The employer installed a counterbalanced tool that allows the operator to sit level with the wheel and work with his legs and back relaxed.

Photo by Michael L. Abramson/Time Life Pictures/Getty Images

6. **LEADERSHIP DEVELOPMENT.** Leadership research strives to identify the traits, behaviors, and skills that great leaders have in common. One goal is matching an organization's mission with the optimal leadership profile.
7. **TEAM BUILDING.** Team membership and successful team design are critical to the needs of today's organizations.
8. **QUALITY OF WORK LIFE.** Psychologists in this area study the factors that contribute to a productive and healthy workforce, such as perk packages and employee-centered policies.
9. **ERGONOMICS.** The focus of ergonomics is the design of equipment and the development of work procedures based on human capabilities and limitations. Ergonomics helps employers provide healthier and safer workplaces.

History of I/O Psychology

Although I/O psychology is often misperceived as a new field in psychology, it is actually more than a century old. In Chapter 1, you learned about Wilhelm Wundt, generally credited as the founder of psychology. Wundt's first research assistant, James McKeen Cattell, broke new ground in the field of mental testing (Cattell, 1890), thus influencing the job application process as we know it today. If you've ever taken a personality test, an IQ test, or even a state-mandated academic achievement test, then Cattell's concept of mental testing has affected your life. In 1921, Cattell founded the Psychological Corporation, one of the largest publishers of psychological tests. Today, pre-employment testing has become a basic step for screening job applicants, helping many organizations with their hiring decisions.

Another one of Wundt's students, Hugo Münsterberg, is considered by many to be the father of I/O psychology. His book, *Psychology of Industrial Efficiency* (1913), was the field's first textbook. Here, Münsterberg explained the benefits of matching the job to the worker. He believed that successful matches had multiple benefits, including increased job satisfaction, improved work quality, and higher worker productivity.



Hugo Münsterberg (1863–1916) After earning his Ph.D. in psychology at the University of Leipzig in 1887, Münsterberg established himself as a pioneer in applied psychology, extending his research to business, medical, legal, and educational settings. Invited by William James to teach at Harvard University, Münsterberg taught there until his death.

Science Source/Photo Researchers

Industrial (Personnel) Psychology

Three major goals of personnel psychologists are selecting the best applicants for jobs; training employees so that they perform their jobs effectively; and accurately evaluating employee performance. The first step in attaining each of these goals is to perform a job analysis.

Job Analysis

When job descriptions are lacking or inaccurate, employers and employees may experience frustration as tasks are confused and positions are misunderstood or even duplicated. Consequently, I/O psychologists are called upon to conduct job analyses that result in accurate job descriptions, benefiting everyone involved. Outdated or inflated job descriptions may land organizations in legal hot water. More specifically, a job description that indicates more

JOB ANALYST alternate titles: personnel analyst

Collects, analyzes, and prepares occupational information to facilitate personnel, administration, and management functions of organization; consults with management to determine type, scope, and purpose of study. Studies current organizational occupational data and compiles distribution reports, organization and flow charts, and other background information required for study. Observes jobs and interviews workers and supervisory personnel to determine job and worker requirements. Analyzes occupational data, such as physical, mental, and training requirements of jobs and workers, and develops written summaries, such as job descriptions, job specifications, and lines of career movement. Utilizes developed occupational data to evaluate or improve methods and techniques for recruiting, selecting, promoting, evaluating, and training workers, and administration of related personnel programs. May specialize in classifying positions according to regulated guidelines to meet job classification requirements of civil service system, a specialty known as Position Classifier.

FIGURE B.1 A Sample Job Analysis The job analysis is a crucial tool in personnel psychology. A thorough job analysis can be a necessary step not only for selecting job applicants but also in training employees for specific positions and in evaluating their performance. This job analysis is for the job of job analyst itself.

Source: *Dictionary of Occupational Titles (1991).*

knowledge, skill, or ability than is actually needed to perform well in a job could violate the Americans with Disabilities Act. For example, sewing straight seams may be determined more by one's sense of touch than by perfect vision; thus, if a garment manufacturer required sewing machine operators to have perfect vision, then visually impaired people—some of whom may be able to sew perfect seams—would be excluded unfairly from employment. The Equal Employment Opportunity Commission (EEOC), the Department of Labor (DOL), and the Americans with Disabilities Act (ADA) all endorse job analysis as a precautionary method to avoid legal problems (EEOC, 1999).

Job analysis is a technique that identifies the major responsibilities of a job, along with the human characteristics needed to fill it. Someone performing a job analysis may observe employees at work, interview them, or ask them to complete surveys regarding major job duties and tasks. This information is then used to create or revise job descriptions, such as the example given in Figure B.1. Sometimes this information can even be used to restructure an organization. Why should an employer invest in this process? When job analysis is the foundation of recruitment, training, and performance management systems, these systems have a better chance of reducing turnover and improving productivity and morale (Felsberg, 2004).

Job analysis is also important for *designing effective training programs.* In 2007, U.S. organizations spent over $58.5 billion on training programs for their employees ("Training," 2007). I/O psychologists can assist organizations in creating customized and effective training programs that integrate job analysis data with organizational goals. Modern training programs should include collaborative and on-demand methods, such as e-learning, virtual classrooms, and podcasts, so as to maximize training success. "With the younger generation of employees, organizations need to rethink how they deliver learning," explains Karen O'Leonard, analyst and project leader of the "2007 Training Industry Report." "Today the most important trends are toward audio, mobile, and collaborative environments" ("Training," 2007). The best training results are achieved not only through effective delivery methods but also when the training objectives are directly linked to performance measures.

Finally, job analysis is useful in *designing performance appraisal systems.* Job analysis defines and clarifies job competencies so that performance appraisal instruments may be developed and training results can be assessed. This process helps managers make their expectations and ratings clear and easy to understand. As more companies realize the benefits of job analysis, they will call upon I/O psychologists to design customized performance management systems to better track and communicate employee performance.

Matching Job and Applicant A job analysis helps to pinpoint the qualities a person must have to succeed at a particular job. Not everyone has the special combination of compassion and toughness needed to be an effective physical therapist, for instance.



Tom Stewart/Corbis

A Closer Look at Personnel Selection

Whether you are looking for a job or trying to fill a position at your company, it's helpful to understand the personnel selection process. The more you know about how selection decisions are made, the more likely you are to find a job that fits your needs, skills, and interests—and this benefits employers and employees alike.

The goal in personnel selection is to hire only those applicants who will perform the job effectively. There are many selection devices available for the screening process, including psychological tests, work samples, and selection interviews. With so many devices available, each with strengths and weaknesses, personnel psychologists are often called upon to recommend those devices that might best be used in a particular selection process. Consequently, they must consider **selection device validity,** the extent to which a selection device is successful in distinguishing between those applicants who will become high performers and those who will not.

Psychological Tests

job analysis A technique that identifies the major responsibilities of a job, along with the human characteristics needed to fill it.

selection device validity The extent to which a personnel selection device is successful in distinguishing between those who will become high performers at a certain job and those who will not.

Charles Wonderlic, president of the Wonderlic Testing Firm and grandson of the founder, explains why psychological tests are so frequently used in the selection process: "To make better hiring and managing decisions that reduce turnover and improve sales, many store owners add personality profiling tools and other tests to their hiring process because it offers recruiters insight into candidates' traits they may not have even thought to explore" (Wonderlic, 2005). A survey of Fortune 1000 firms ($n = 151$) found that 28 percent of employer respondents use honesty/integrity tests, 22 percent screen for violence potential, and 20 percent screen for personality (Piotrowski & Armstrong, 2006). The survey also reveals that up to a third of employers may soon include online testing as a part of their screening process. Employers want quick, inexpensive, and accurate ways to identify whether applicant qualifications, aptitudes, and personality traits match the position requirements. Common types of psychological tests are integrity/honesty tests, cognitive ability tests, mechanical aptitude tests, motor and sensory ability tests, and personality tests.

Let's first examine the popularity of *integrity tests,* which came about largely because of legislation limiting the use of polygraph tests in the workplace. According to the *2007 National Retail Security Survey* (Hollinger & Adams), employee theft accounted for approximately half of all retail losses, at $19.5 billion—way ahead of the $13.3 billion cost of shoplifting. The hiring of honest employees is definitely in the company's best interest. Unfortunately, integrity tests are plagued with concerns about validity, reliability, fairness, and privacy (Karren & Zacharias, 2007). Some researchers are working diligently to address issues like high rates of false positives, and the ability to "fake" an honest answer (Marcus & others, 2007). Despite these problems, several million integrity tests are administered in the United States every year (Wanek & others, 2003).

Cognitive ability tests measure general intelligence or specific cognitive skills, such as mathematical or verbal ability. The Wonderlic Personnel Test-Revised (WPT-R), was released in January 2007. This 12-minute test of cognitive ability, or general intelligence, has been taken by more than 125 million people since 1937 (Press Release Newswire, 2007). Sample items from two cognitive ability tests are presented in Figure B.2. *Mechanical ability tests* measure mechanical

(a) 1. RESENT/RESERVE — Do these words
1 have similar meanings
2 have contradictory meanings
3 mean neither the same nor opposite
2. Paper sells for 21 cents per pad. What will 4 pads cost?

(b)



For each item find the picture that goes best with the picture in the first box. Draw a dark line from the upper right corner to the lower left corner in the proper box to show the right answer.

FIGURE B.2 Sample Items from Two Cognitive Ability Tests Cognitive ability tests can measure either general intelligence or specific cognitive skills, such as mathematical ability. **(a)** These two items are from the Wonderlic Personnel Test, which is designed to assess general cognitive ability. Employers assume that people who cannot answer most questions correctly would not be good candidates for jobs that require general knowledge and reasoning skills. **(b)** The chart is from the Non-Verbal Reasoning Test. It assesses reasoning skills apart from the potentially confounding factor of skill with the English language.

Sources: Corsini (1958); Wonderlic (1998).

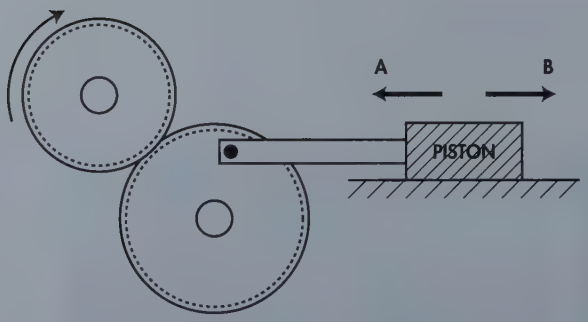
reasoning and may be used to predict job performance for engineering, carpentry, and assembly work. Figure B.3 presents sample items from the Resource Associates Mechanical Reasoning Test. *Motor ability tests* include measures of fine dexterity in fingers and hands, accuracy and speed of arm and hand movements, and eye–hand coordination. *Sensory ability tests* include measures of visual acuity, color vision, and hearing.

Personality tests are designed to measure either abnormal or normal personality characteristics. An assessment of abnormal personality characteristics might be appropriate for selecting people for sensitive jobs, such as nuclear power plant operator, police officer, or airline pilot. Tests designed to measure normal personality traits, however, are more popular for the selection of employees (Bates, 2002). Tests based on the Big Five Model allow employers to identify traits such as conscientiousness, extraversion, and agreeableness (Bates, 2002). This information can also be used to understand employee motivation and enhance team building and team placement.

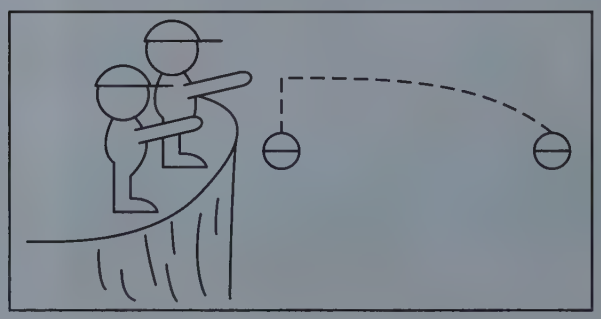
Work Samples and Situational Exercises

Two other kinds of personnel selection devices are work samples and situational exercises. Work samples are typically used for jobs involving the manipulation of objects, while situational exercises are usually used for jobs involving managerial or professional skills. Work samples have been called "high-fidelity simulations" in that they require applicants to complete tasks as if they were on the job (Motowidlo & others, 1997). Recently, companies like Toyota, Quest Diagnostics, and SunTrust Bank have been using interactive job simulations in their selection steps.

At Toyota, applicants must demonstrate their ability to read dials and gauges and spot safety problems in a virtual setting as a part of their "Computer Assembler Audition." Quest Diagnostics is using online video previewing of jobs to educate potential applicants about the typical workday of a phlebotomist. This step helps reduce



Given the direction of rotation of the outer gear, which direction is the PISTON moving?
A: Direction A
B: Direction B

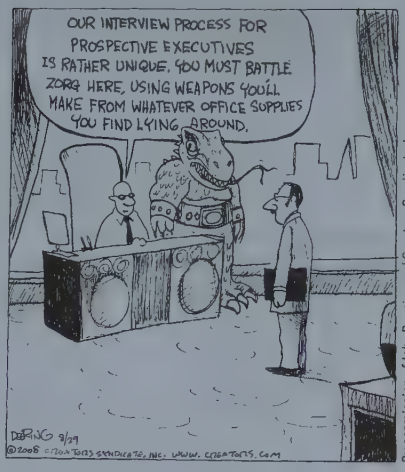


One ball is dropped while the other is simultaneously thrown horizontally out. Which ball will hit the ground first?
A: Dropped the ball
B: Thrown ball
C: Same

FIGURE B.3 Sample Items from a Mechanical Ability Test Questions such as these from the Resource Associates Mechanical Reasoning Test are designed to assess a person's ability to figure out the physical properties of things. Such a test might be used to predict job performance for carpenters or assembly-line workers.

Courtesy of Resource Associates, Inc.

turnover. Finally, use of an online screening and assessment system allowed SunTrust Bank to shorten the previous two- to four-week pre-employment process down to a single week. Employers are also learning that "[job] simulations can reduce the risk of litigation, since these methods are more closely aligned to the job." (Winkler, 2006).



By permission of John Deering and Creators Syndicate, Inc.

Selection Interviews

Great news! You passed the pre-employment test and have been called in for an interview. Now it's just a matter of sailing through the objective interview, right? Wrong! Chances are that the company's interviewing methods are subjective, outdated, and non-research based. The Society for Human Resource Management (SHRM) has found that many companies continue to ignore the growing body of research that supports objective selection strategies. In its 2006 survey, SHRM found that as many as 40 percent of responding companies reported continued use of unstructured interviews, sometimes developed "off-the-cuff," as opposed to the structured behavioral interviews recommended by the research. Furthermore, only 24 percent actually used scoring scales to rate the interviewee responses, fostering even greater subjectivity.

In contrast to unstructured interviews, *structured behavioral interviews,* if developed and conducted properly, are adequate predictors of job performance. A structured interview should be based on a job analysis; prepared in advance; standardized for all applicants; and evaluated by a panel of interviewers trained to record and rate the applicant's responses using a numeric rating scale. When these criteria are met, the interview is likely to be an effective selection tool (Krohe, 2006).

Organizational Behavior

Organizational behavior (OB) focuses on how the organization and the social environment in which people work affects their attitudes and behaviors. Job satisfaction is the attitude most thoroughly researched by I/O psychologists, with over 10,000 studies to date. The impact of leadership on attitudes and behaviors is another well-researched OB topic. We will examine both of these topics here.

Job Satisfaction

Lucy and Jane are both engineers who work in the same department of the same company. Lucy is almost always eager to get to work in the morning. She feels that her work is interesting and that she has plenty of opportunities to learn new skills. In contrast, Jane is unhappy because she feels that she doesn't get the recognition she deserves at work. She also complains that the company doesn't give enough vacation time to employees and that it provides inadequate benefits. Jane can't think of many good things about her job. She's even beginning to feel that her job is negatively affecting her personal life.

Fortunately, Lucy is more typical of U.S. workers than Jane is. A recent *International Herald Tribune*/France 24/Harris Interactive survey reported that at least two-thirds of U.S. workers say they are satisfied with the type of work they do and their pay (Harris Interactive, 2007).

Several approaches have been used to explain differences in job satisfaction. An early approach was based on a **discrepancy hypothesis,** which consists of three ideas: (1) that people differ in what they want from a job; (2) that people differ in how they evaluate what they experience at work; and (3) that job satisfaction is based on the difference between what is desired and what is experienced (Lawler, 1973; Locke, 1976). Lucy and Jane, for instance, may not only want different things from their jobs; they may also make different assessments of the same

■ **discrepancy hypothesis** An approach to explaining job satisfaction that focuses on the discrepancy, if any, between what a person wants from a job and how that person evaluates what is actually experienced at work.

trait approach to leader effectiveness An approach to determining what makes an effective leader that focuses on the personal characteristics displayed by successful leaders.

behavioral theories of leader effectiveness Theories of leader effectiveness that focus on differences in the behaviors of effective and ineffective leaders.

situational (contingency) theories of leadership Leadership theories claiming that various situational factors influence a leader's effectiveness.

events at work. Although their supervisor may treat them in the same encouraging manner, Lucy may see the boss's encouragement as supportive while Jane may view it as condescending. As a result, one perceives a discrepancy between desires and experiences, whereas the other does not.

Consequent research supported the discrepancy hypothesis. For example, negative discrepancies (getting less than desired) were found to be related to dissatisfaction. Interestingly, positive discrepancies (getting more than desired) were also related to dissatisfaction in some cases (Rice & others, 1989). As an example, you might be dissatisfied with a job because it involves more contact with customers than you wanted or expected.

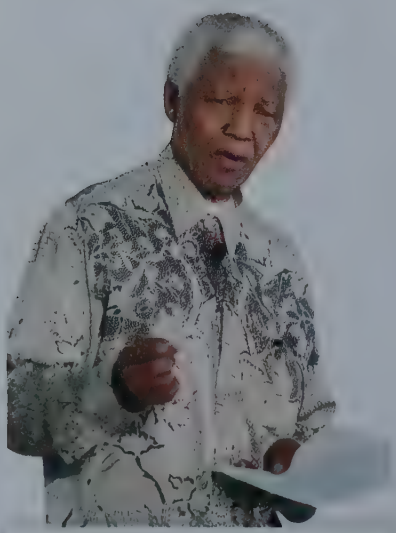
However, other factors have been identified as contributing to job satisfaction. The 2007 SHRM Job Satisfaction Survey lists compensation, benefits, job security, work–life balance, and communication between employees and senior management as the current top five "very important" job satisfaction aspects for employees (Lockwood, 2007).

Leadership

I/O psychologists have invested extensive energy searching for the formula for a great leader. *Leaders* are those who have the ability to direct groups toward the attainment of organizational goals. There are several classic theories that shaped our early views of leadership. The **trait approach to leader effectiveness,** one of the earliest theories, was based on the idea that great leaders are *born*, not made. This approach assumed that leaders possess certain qualities or characteristics resulting in natural abilities to lead others. Some examples of these "natural-born" leaders included John F. Kennedy, Martin Luther King, Jr., and Nelson Mandela. A large number of traits—such as height, physical attractiveness, dominance, resourcefulness, and intelligence—were examined for connections to leader effectiveness. A substantial amount of trait research was initially conducted, much of it showing little connection between personal traits and leader effectiveness (Hollander & Julian, 1969; Stogdill, 1948). Recent trait research continues, with some studies identifying traits, such as emotional intelligence, that can have a positive impact on employee behavior (Rego & others, 2007). Unfortunately, to date, trait researchers still haven't found a comprehensive "leadership recipe."

Consequently the emphasis turned to another explanation for effective leadership. Could leaders be *made*? Could they be taught "leadership behaviors" that would make them more effective? Researchers exploring the **behavioral theories of leader effectiveness** reasoned that the behaviors of effective and ineffective leaders must differ. In 1960, Douglas McGregor published *The Human Side of Enterprise,* in which he outlined Theory X and Theory Y, creating the view that leaders were polarized into those who either cared about the job (X) or cared about the people (Y). Research on these two dimensions found that ineffective managers focused on only one dimension. For example, if your boss cares only about production, then your job satisfaction and morale may decline. In contrast, if your boss is "all heart" but holds no production expectations, your job satisfaction may be high but your productivity low (Bass, 1981; Locke & Schweiger, 1979). A few years after McGregor's book was published, Robert Blake and Jane Mouton expanded upon the theory with their Managerial Grid, claiming it was possible to care about *both* productivity and people. By placing these two variables on a grid, they could plot five primary managerial styles (see Figure B.4). A manager with low ratings in both areas was labeled (1,1) an "Impoverished Manager." In contrast, one scoring highest on both concern for production and concern for people was labeled (9,9) the "Team Leader" (Blake & Mouton, 1985).

Next to evolve were **situational** (or **contingency**) **theories of leadership,** which stated that there was no one "best" way to manage *every* employee. These theories



What Makes a Leader? Nelson Mandela is an extraordinarily charismatic leader. He kept his political organization, the African National Congress, functioning during his 27 years of imprisonment and guided South Africa out of its racist apartheid system with a minimum of violence and turmoil.

REUTERS/Jeff Christensen

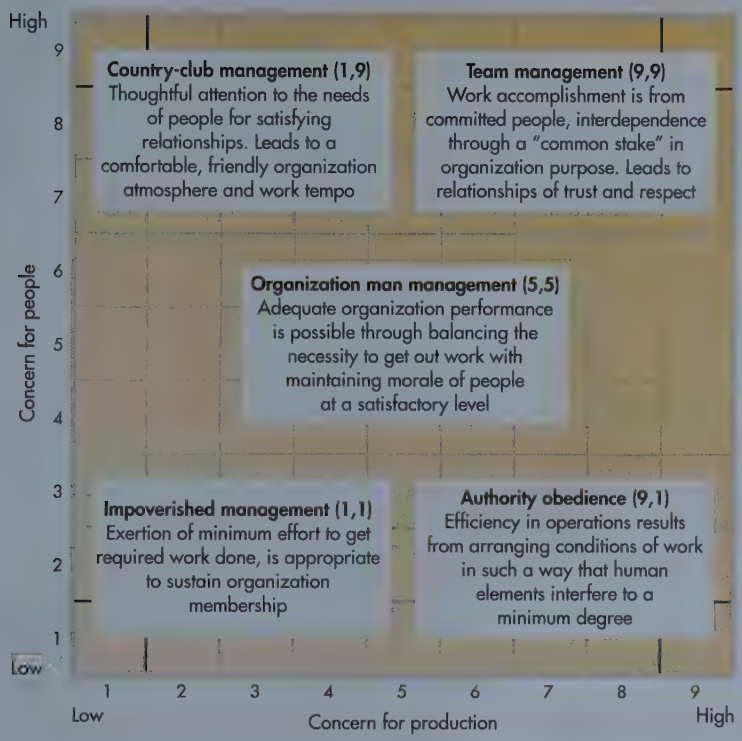


FIGURE B.4 Robert Blake and Jane Mouton's "Managerial Grid" identifies five different leadership styles. With *concern for production* as the *x*-axis and *concern for the people* as the *y*-axis, managerial styles can be assessed based on whether they rank low or high on these concerns.

claimed that good leadership skills depend, or are contingent upon, various situational factors, such as the structure of the task and the willingness of the follower. Accordingly, the best leaders will utilize the leadership style most appropriate for the employee and the situation at hand. These theories tended to be complicated, but they did a better job of explaining leader effectiveness than either the trait approach or behavioral theories.

Much of the research on leadership emphasized the impact of leaders on followers, ignoring the fact that followers also influence leaders. In contrast, a modern approach, called the **leader–member exchange model,** emphasizes



AP Photo/Paul Sakuma

What Makes a Leader? At 23 he was worth $1 million, at 24 it was $10 million, by 25 it was over $100 million, and by 30 years of age his board of directors fired him from the company he started. Who is he? Steve Jobs, of course. When he and Steve Wozniak began building computers in his parents' garage, neither one imagined what the future held: the multinational company Apple Inc. *Fortune* credits Jobs with changing the world with a series of innovations in personal computers, software development, the music industry, and film animation. Jobs's leadership style wasn't always ideal, as he acknowledged. However, Victor Vroom, professor at the Yale School of Management, considers Jobs a transformational leader who championed "higher order values. . . . [He] caused people to do things they might never have done before" (George, 2006).

leader–member exchange model A model of leadership emphasizing that the quality of the interactions between supervisors and subordinates varies depending on the unique characteristics of both.

IN FOCUS

Servant Leadership: When It's Not All About You

What do Jeffrey Skilling, Bernard Ebbers, and Dennis Kozlowski have in common? They were all entrusted with leadership positions for corporate giants such as Enron, WorldCom, and Tyco. They also failed miserably in their posts as leaders. Ebbers, former CEO of WorldCom, was convicted of fraud and conspiracy and is said to have been personally responsible for the $11 billion loss to WorldCom investors. Formerly CEO of the now-defunct Enron, Jeffrey Skilling went to federal prison after having been found guilty of fraud and insider trading in one of America's most notorious cases of corporate corruption. Kozlowski, too, went to prison, convicted of misappropriating $400 million of his company's funds while he was CEO of Tyco.

All three of these individuals are what some researchers call *narcissistic leaders*. Research on selfish leadership demonstrates that narcissistic leaders display certain behaviors that make them more likely to take self-serving risks, inconsiderate of the role of stewardship placed upon them as leaders. One study found that such CEOs focus on themselves at the expense of organizational awareness (Chatterjee & Hambrick, 2007). By featuring their pictures, their names, and their stories on organizational literature, these CEOs demand all the attention, instead of sharing the spotlight with the hardworking "stagehands" behind the scenes.

If you've ever known a highly narcissistic individual, it was probably not by choice. As employees, we like to receive recognition and at least some acknowledgement that what we do is valued. Selfish leaders are unable to fill our needs because of their own need to have their egos stroked on a constant basis. Their belief system includes self-promoting ideas such as, "I am, by far, the most valuable person in this organization," or "Leadership is a solo endeavor, not a group activity" (Chatterjee & Hambrick, 2007).

Enter the servant leader. In 1970, Robert Greenleaf, a retired AT&T corporate executive, was the first to use the term *servant leader*. He defined a servant leader as one who makes service to others, including one's employees, the foremost leadership objective. Greenleaf believed that servant leaders are successful because of their sincere commitment to helping their followers succeed. They invert the organizational chart, placing employee needs above their own (Zandy, 2007). Employee centeredness, where the leader's focus is on employee concerns, allows leaders to roll up their sleeves during crunch times. Most important, servant leaders' humility allows them to recognize their employees as emerging leaders who need organizational support to reach their potential. Humility is the servant leader's most prominent trait, unlike the narcissistic leader's self-promotion.

Warren Buffet, one of the richest men in the world, exemplifies servant leadership. Buffet's financial success often overshadows his generous spirit and humble demeanor; he recently pledged to give 99% of his $47 billion fortune to charity. As a leader, he values the development of his staff and colleagues, often acknowledging his own mistakes before announcing their successes. His ethical transparency allows everything to be disclosed. Buffet says, "You don't need to play outside the lines. You can make a lot of money hitting the ball down the middle" (George, 2006). If only Skilling, Ebbers, and Kozlowski had followed his lead.

two types of relationships that can develop between leaders and employees. Positive leader–member relationships are characterized by mutual trust, respect, and liking. These relationships have numerous benefits, including higher job satisfaction, goal commitment, improved work climate, and lower turnover rates (Gerstner & Day, 1997). Negative leader–member relationships show a lack of trust, respect, and liking. These relationships lead to decreased job satisfaction and job performance, among other consequences (Gomez & Rosen, 2001). This research shows that effective leaders manage to establish positive relationships by setting high expectations and making an effort to build trust and reciprocal respect.

More recently, leadership research has focused on topics such as transformational versus transactional leadership, charismatic leadership, shared leadership, and servant leadership, which is highlighted in the In Focus box "Servant Leadership: When It's Not All About You." Although they've yet to find the formula for a perfect leader, researchers have shed a bright light on the optimal conditions for leadership development.



Workplace Trends and Issues

The Society for Human Resource Management (SHRM, 2007) has identified the top challenges facing companies today:

1. Succession planning (replacement of retiring leaders)
2. Recruitment and selection of talented employees

3. Engaging and retaining talented employees
4. Providing leaders with the skills to be successful
5. Rising health care costs
6. Creating/maintaining a performance-based culture (rewarding exceptional job performance)

To face these challenges, the workplace of the future is expected to become more dynamic, diversified, flexible, and responsive. Organizations and their employees will need to adapt to the ever-changing world of work, complete with resource limitations and technological innovations. Let's examine how some of these challenges are being addressed.

Workforce Diversity: Recruiting and Retaining Diverse Talent

Changing workforce demographics continue to challenge many employers (see the In Focus box "Name, Title, Generation"). Diverse employees have diverse needs, interests, and expectations. Organizations that can best address these issues will be most likely to attract top candidates. Several organizations are

IN FOCUS

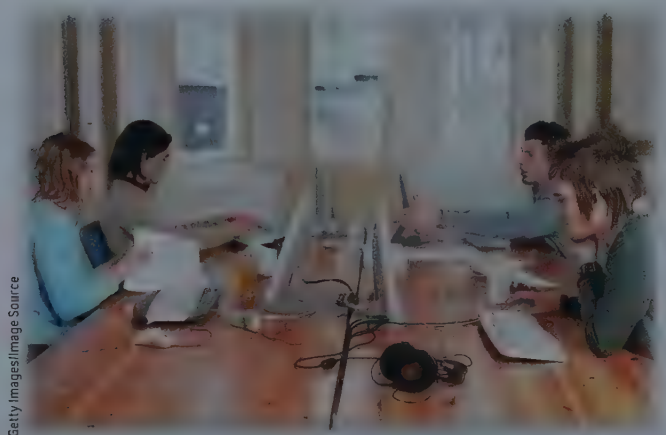
Name, Title, Generation

If you visit MySpace, Facebook, and YouTube as part of your daily routine, you're probably a millennial. If avatar, blog, and Wiki don't sound like Star Wars characters to you, then you're surely a millennial. So what's a millennial? Google it, and you'll find millennials are the Net Generation, born between 1981 and 1999. Millennials, also called Generation Y, are walking around loaded—with gadgets, that is. They are the most technologically savvy generation, and they have entered the workplace. They're great at multi-tasking, pragmatic thinking, future-looking, team playing, and tech-operating. But they have their faults, too: They wear iPods during meetings, assume everything is public, have narcissistic tendencies, demand immediate praise, and don't like to be criticized, not even constructively (Tyler, 2008).

Generation gaps are challenging employers in many ways. Some employers are seeing as many as four generations of workers walk through their doors. In their book titled *When Generations Collide: Who They Are. Why They Clash. How to Solve the Generational Puzzle at Work* (2002), authors Lynne C. Lancaster and David Stillman discuss the generational issues facing the workplace. Multiple age groups means differing values, goals, and perceptions. In one example, they describe the ways the four generations view the process of feedback:

- Traditionalists (born 1900–1945): No news is good news.
- Baby boomers (born 1946–1964): Once a year, with lots of documentation.
- Generation Xers (born 1965–1980): Sorry to interrupt, but how am I doing?
- Millennials (born 1981–1999): Feedback whenever I want it at the push of a button . . . and NOW!

Surely, the workplace of the future must embrace all generations, train them to get along, and build complementary teams. Leaders of the future will need to inspire *all* of their employees, from the traditionalists to the millennials.



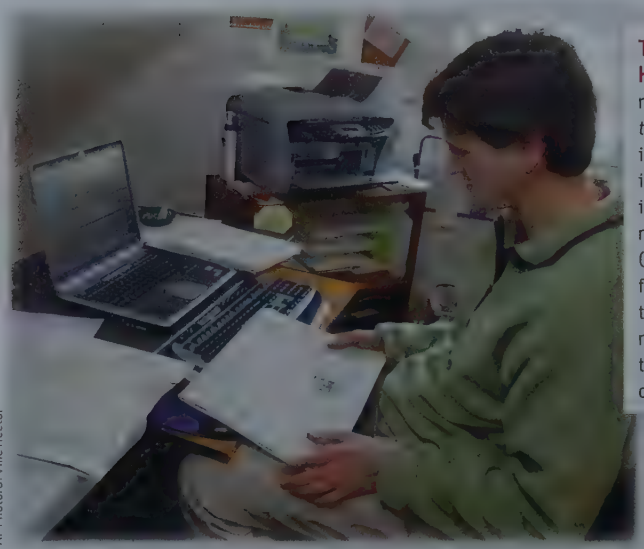
Getty Images/Image Source

Differing Work Styles Millennials often prefer to work collaboratively and may be most comfortable with the constant interaction that this work environment facilitates.

creating excellent perk packages to recruit among the diversified field of top candidates. *Fortune's* "100 Best Companies to Work For" (2008) shows more companies offering telecommuting (84 percent), compressed workweeks (82 percent), on-site gyms (69 percent), job sharing (63 percent), and on-site child care (29 percent), many of which are highly desirable to different populations such as working parents or older workers. Google, *Fortune's* Best Company, doesn't stop there. At Google headquarters in Mountain View, California, employees enjoy an amazing variety of on-site services such as gourmet meals, child care, health care, oil changes, car washes, dry cleaning, massage therapy, gyms, hairstylists, and fitness classes, to name just a few. Often called the Google Campus, this laid-back environment has proved successful in attracting the best candidates in the industry.

Telework and Telecommuting: The Best Retention Tool

The latest estimates show that 33 million Americans hold jobs that could be performed at home by telecommuting (Fisher, 2008). Telecommuting programs offer advantages such as flexible work schedules, more freedom at work, and less time wasted commuting. One study focused on the best practices of several telework organizations, including Intel Corporation, Hewlett-Packard, and Dow Chemical Corporation. These organizations were identified as having model telework programs in place, with recruitment and retention as the primary organizational benefits (Telework Coalition, 2006). More recently, the 2008–2009 WorldatWork Salary Budget Survey (n = 2,288) reported that the number of respondent employers offering telework options to their employees jumped from 30 percent in 2007 to 42 percent in 2008 (WorldatWork, 2008–2009). As with any major change in the workplace, telework poses new challenges to organizations. How does working from home affect performance, workplace relations, and career prospects? A recent meta-analysis asked these and many other questions about the effects of telecommuting (Gajendran & Harrison, 2007). The researchers found telecommuting has predominantly positive effects for both employees and employers, including higher job satisfaction, employee morale and autonomy, and improved supervisor–employee relations. I/O psychologists may guide employers to accept telework as an important solution to many problems.



AP Photo/Orville Hector

Telework or Telecommuting: Working at Home As telecommunication technology has become more widespread, so has the number of employees who *telecommute* or work from home. For the self-motivated individual with good communication skills, telecommuting offers the advantages of greater autonomy and flexible time management. On the down side, teleworkers are more likely to work in the evenings and on the weekends (Steward, 2000). Men and women vary in their reasons for telecommuting. Being able to earn money and care for their children at the same time is a motivating factor for many women (Sullivan & Lewis, 2001). Some people, like the financial analyst pictured here, work from home in order to avoid a long commute.

Internet Recruiting: Using the Web to Recruit Top Talent

Internet job-search services, such as monster.com, hotjobs.com, and company Web sites, have changed the way in which employees are recruited. In its 2007 survey, the Conference Board, a global business membership and research organization, found that 73 percent of job seekers used the Internet to find information about prospective employers, to post resumes on job boards, and to gain career advice. This surge in Internet job-seeking poses new challenges for employers, such as compliance with new legal requirements for online applicant tracking, or simply how to narrow down the multitude of resume submissions brought on by the ease of resume posting.

Work–Life Balance: Engaging and Retaining Employees with Families

Juggling the demands of both career and family can lead to many conflicts. This struggle, often called *work–family conflict,* results in higher absenteeism, lower morale, and higher turnover in the workplace. Further, results from a meta-analysis reviewing 38 studies found that employee perceptions of family-friendly work culture, along with supportive bosses and spouses, can reduce work–family conflict (Mesmer-Magnus & Viswesvaran, 2006). Therefore, it makes good business sense to help working parents balance the demands of work and family life. Unfortunately, several studies indicate that few U.S. employers have family-friendly policies. A recent *Forbes* survey revealed that the U.S. workplace is not family-oriented when compared with other industrialized countries (*Forbes,* 2007). The *Forbes* survey found that paid maternity and paternity leave, paid sick days, alternative work schedules, and other such family-friendly policies are lacking in many U.S. companies. Research also shows that "[workplace] policies for families in the U.S. are weaker than those of *all* high-income countries and even many middle- and low-income countries" (Heymann, 2007). Although many companies advertise family-friendly environments, few of them actually offer initiatives such as flexible scheduling. More employers must begin to adopt family-friendly policies and build pro-family cultures to attract and retain this large sector of the workforce.

To keep pace with evolving challenges such as the ones described above, I/O psychologists will constantly need to adjust the focus of their research and its applications. In the future, I/O psychologists will continue to have a significant role in and around the workplace. To explore what it's like to be an I/O psychologist, we'll look at the preparation required for the job, and where you might go from there.



mylife photos/Alamy

Juggling Career and Family
Women compose nearly half of the total U.S. labor force, and work–family conflict has become a more significant issue for parents of both sexes. This businessman must balance his son's childcare schedule against demands at the office.

Employment Settings, Type of Training, Earnings, and Employment Outlook

Many I/O psychologists belong to Division 14 of the American Psychological Association (APA), the Society for Industrial and Organizational Psychology (SIOP). The division conducts periodic surveys of its members and, as a result, can supply information on topics such as typical work settings, job duties, and salary levels of I/O psychologists.

The employment settings of I/O psychologists are represented in Figure B.5 on the next page. Of the I/O psychologists who belong to SIOP and who responded to the 2006 employment setting survey, 41 percent worked in academic settings (primarily universities and colleges); 22 percent worked as consultants to organizations; 17 percent worked in private organizations; and 9 percent worked for public organizations (Khanna & Medsker, 2007).

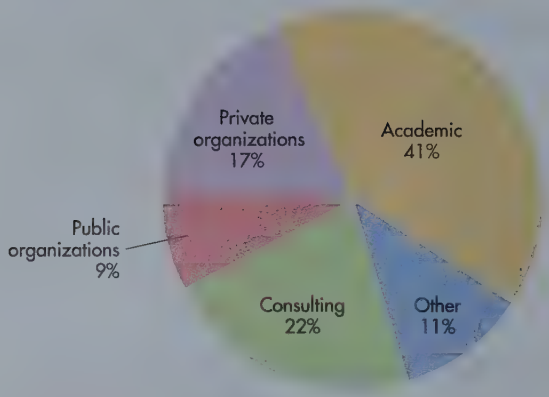


FIGURE B.5 Work Settings of I/O Psychologists Most I/O psychologists work in institutions of higher education. Forty-one percent of the members of the Society for Industrial and Organizational Psychology work in colleges and universities. Next come I/O psychologists who work as consultants to organizations (22 percent). Another substantial percentage (17 percent) are employed by large private corporations, such as insurance companies and consumer-product manufacturers. Public organizations, such as government agencies, employ half as many I/O psychologists as private organizations do (9 percent versus 17 percent).

Source: Khanna & Medsker (2007).

Those with bachelor's degrees may find work in fields related to I/O psychology, such as in the administration of training programs or as interviewers. However, a master's (M.A.) or doctorate (Ph.D.) degree is required to work in the field of I/O psychology. Though there are plenty of programs to choose from, with more than 200 master's and doctorate programs available for I/O psychologists in the United States, admission into these programs can be very competitive, especially at the doctoral level.

The majority of SIOP members hold doctorate degrees (87 percent) as opposed to master's degrees (13 percent). When selecting your degree, you must consider the length and requirements of the program. Are you prepared to attend graduate school as a full-time student for five to six years, conduct a detailed research project, and write a dissertation? If your answer to these questions is yes, then a doctorate degree may be for you. This degree qualifies you for I/O psychologist positions at major corporations and research and teaching positions at colleges and universities, and it provides the most credibility to conduct consulting work.

If you would prefer to pursue a degree that allows you to quickly apply your knowledge and skills to the workplace, then a master's degree may be a better fit. Most master's programs require two to three years of graduate course work and the completion of a research project. Having a master's degree allows you to work as an I/O psychologist carrying out I/O duties for private or public organizations, teach at two-year colleges, and take on consulting opportunities.

Finally, a bachelor's degree, attained after four years of undergraduate course work, yields numerous employment opportunities in areas involving I/O psychology. These positions include jobs for personnel, training, and labor-relations specialists. Although these jobs are expected to show faster-than-average job growth through the year 2016, the high number of qualified college graduates and experienced workers will keep these jobs highly competitive (U.S. Bureau of Labor Statistics, 2008).

What's the payoff for all this education and hard work? Salaries for I/O psychologists are dependent upon educational qualifications, industry, and experience. The 2006 salary survey of SIOP members indicated that the median salary for those with doctorate degrees was $98,500; for those with master's degrees, the median salary was $72,000 (Khanna & Medsker, 2007). It also helps to know that the job market for I/O psychologists has remained strong over the years and is projected to have an above-average growth rate (21 percent) through 2016 (Occupational Outlook Handbook, 2008–2009).

If you would like to learn more about career opportunities in I/O psychology, visit some of the Web sites listed in Table B.1.

TABLE B.1

Below is a list of Web sites that relate to working in the field of industrial/organizational psychology.

www.aomonline.org	Academy of Management
www.dol.gov	U.S. Department of Labor Job Information Site
www.shrm.org	Society for Human Resource Management
www.siop.org	Society for Industrial and Organizational Psychology
www.bls.gov	U.S. Department of Labor, Bureau of Labor Statistics
www.onetcenter.org	Occupational Information Network

APPENDIX REVIEW

Industrial/Organizational Psychology

KEY POINTS

What Is Industrial/Organizational Psychology?

- **Industrial/organizational (I/O) psychology** is a broad field that examines human behavior in the workplace. I/O psychologists focus on either Industrial (personnel) or Organizational functions. The "industrial," or "I," side of I/O psychology is also called **personnel psychology.** The "organizational," or "O," side is sometimes called **organizational behavior.**

Personnel Psychology

- A first step in the work of personnel psychologists is to perform a **job analysis**—a determination of the major responsibilities of a certain job and the human characteristics needed to fill it. A good job analysis is key to successful personnel selection, effective job training programs, and accurate evaluation of job performance.
- Personnel psychologists use devices such as psychological tests, work samples, situational exercises, and selection interviews to help select the best applicants. Personnel psychologists must consider **selection device validity**—the extent to which the device succeeds in distinguishing between those applicants who will become high performers and those who will not.

Organizational Behavior

- **Job satisfaction** has been extensively studied in the field of organizational behavior. Researchers have tried to explain different levels of job satisfaction by studying the **discrepancy hypothesis,** which focuses on gaps between what a person wants from a job and what he or she actually experiences.
- Leadership is also a widely studied topic in the field of organizational behavior. Researchers have tried to explain leadership effectiveness through the **trait approach to leader effectiveness, behavioral theories of leader effectiveness,** and **situational (contingency) theories of leadership.** Of these three approaches, situational theories seem to do the best job. Research also examines how supervisors and subordinates interact (the **leader–member exchange model**).

Workplace Trends and Issues

- The workplace of today has been influenced greatly by technological advances. The Internet has affected the ways in which employers seek job candidates and the ways in which job candidates learn about potential employers. It has also allowed more employees to work from home. Workforce diversity continues to increase and now includes up to four generations in the workplace. Finally, many employees are concerned about work–life balance and work–conflict. Consequently, employers are faced with the need to change their policies and build family-friendly cultures to attract and retain good employees.

Employments Settings, Type of Training, Earnings, and Employment Outlook

- A doctorate or master's degree is required to work as an I/O psychologist.
- I/O psychologists may work in colleges or universities or as consultants to organizations. They may also work for large private corporations or for public institutions, such as government agencies.
- Jobs in I/O-related fields for people with bachelor's degrees include personnel, training, and labor-relations specialists and managers; as well as management analysts and consultants.

KEY TERMS

industrial/organizational (I/O) psychology, p. B-2
personnel psychology, p. B-2
organizational behavior, p. B-2
job analysis, p. B-4
selection device validity, p. B-4
discrepancy hypothesis, p. B-7
trait approach to leader effectiveness, p. B-8
behavioral theories of leader effectiveness, p. B-8
situational (contingency) theories of leadership, p. B-8
leader–member exchange model, p. B-9

Web Companion Review Activities

You can find additional review activities at www.worthpublishers.com/psychology6e

The *Psychology* 6th edition Web Companion has self-scoring practice quizzes, flashcards, interactive crossword puzzles, and other activities to help you master the material in this chapter.

APPENDIX C

APA Principles for Quality Education in Psychology and APA Goals and Outcomes

APA Principles for Quality Education in Psychology

The American Psychological Association Council of Representatives approved in 2011 the "Principles for Quality Education in Psychology." This set of five principles is intended to help undergraduate institutions "produce psychologically literate citizens who apply the principles of psychological science at work and at home." These principles are directed to all stakeholders in undergraduate education in psychology. The following list illustrates how well Hockenbury and Hockenbury's *Psychology*, Sixth Edition, supports introductory psychology students and instructors in achieving these goals.

Quality Principle 1: Students are responsible for monitoring and enhancing their own learning.

- The Hockenburys' strong pedagogical system promotes active learning. Multiple learning aids in the text help students identify important information, test for retention, and learn how to learn. Chapter Outlines provide an overview of main topics, while Advance Organizers identify Key Themes of each major section. Advance Organizers also offer Key Questions, which help students focus on the most important material. Chapter Reviews prompt students to self-assess, while end-of-section Concept Reviews help consolidate learning.
- The *Psychology,* Sixth Edition, Web companion site provides a free, virtual study guide with self-scoring quizzes, flashcards, and critical thinking exercises. The Web companion site can be accessed 24 hours a day, 7 days a week at www.worthpublishers.com/hockenbury6e. The online learning space PsychPortal that accompanies *Psychology*, Sixth Edition, includes the powerful, customized formative quizzing engine, LearningCurve, designed to adapt to each student's mastery level.
- Throughout the text, the Hockenburys guide students in the use of effective learning strategies. For example, the Chapter 6 Enhancing Well-Being with Psychology feature, "Superpower Memory in Minutes per Day!" promotes spacing study sessions, elaborating on the material, and using visual imagery, among other strategies.

Quality Principle 2: Faculty strive to become scientist-educators who are knowledgeable about and use the principles of the science of learning.

- In addition to the extensive, in-text pedagogical system, Hockenbury & Hockenbury is accompanied by PsychPortal, a comprehensive teaching package and media supplements designed to help instructors teach more effectively. PsychPortal offers core teaching and learning components developed with an advisory board of master teachers and learning experts.
- Hockenbury & Hockenbury consistently encourages the development of critical thinking skills. Every chapter shows the process of psychological research and presents both sides of controversial issues. In addition, every chapter offers one or more Critical Thinking boxes that promote practice of critical thinking skills.

Quality Principle 3: Psychology departments and programs create a coherent curriculum.

- Hockenbury & Hockenbury consistently emphasizes the importance of psychology as a science, with attention to contributing disciplines and the scientific method (see Chapter 1 especially).
- Hockenbury & Hockenbury provides a broad, foundational understanding of the field from multiple core perspectives. This comprehensive course content, including research methods and statistics, introduces students to the discipline in a way that allows them to build on introduced concepts in subsequent courses or independent study.

Quality Principle 4: Academic administrators support and encourage quality practices in teaching and learning.

- Launched by Worth Publishers in 2010, the online Faculty Lounge for Introductory Psychology encourages faculty to connect with colleagues nationwide to share teaching strategies, get feedback on resources, and compose activities and resources to support in-class teaching. This resource is free and available 24 hours a day, 7 days a week at http://psych.facultylounge.worthpublishers.com

Quality Principle 5: Policymakers and the general public need to understand why psychological literacy is necessary for informed citizens and an effective workforce.

- Hockenbury & Hockenbury sets students on the right path toward achieving and using psychological literacy by meeting the APA's Goals and Outcomes. The APA Task Force intended these Goals and Outcomes to be met as part of a four-year psychology major, not as goals for the student embarking on this first course in psychology. However, the Hockenburys' textbook, along with its associated media and print supplements, impressively meets the APA's Goals and Outcomes as explicitly outlined in the table on the following pages.

APA Goals and Outcomes

1.1 Characterize the nature of psychology as a discipline.

a. Explain why psychology is a science

b. Identify and explain the primary objectives of psychology: describing, understanding, predicting, and controlling behavior and mental processes

c. Compare and contrast the assumptions and methods of psychology with those of other disciplines

d. Describe the contributions of psychology perspectives to interdisciplinary collaboration

- (1.1a) Chapter 1 (Introduction and Research Methods) on pp. 2–16 discusses the importance of psychology as a science.
- (1.1b) On pp. 16–21 the scientific method is presented, step by step.
- (1.1c) The Hockenbury & Hockenbury text provides references to other disciplines to help students explore similarities and differences. Chapter 1 includes a discussion of the influence of philosophy and physiology on psychology's development, with a reference on p. 3 to ways in which psychology shares assumptions with other disciplines; p. 10 presents a discussion of disciplines that contribute to neuroscience; Chapter 13 (Stress, Health, and Coping) notes examples of influence by or collaboration with the fields of immunology, medicine, and sociology.
- (1.1d) Chapter 5 (Learning) provides examples of applications of learning principles to multiple fields; Chapter 13 (Stress, Health, and Coping) gives examples of applications to medicine.

1.2 Demonstrate knowledge and understanding representing appropriate breadth and depth in selected content areas of psychology:

a. theory and research representing each of the following four general domains:

(1) learning and cognition

(2) individual differences, psychometrics, personality, and social processes, including those related to sociocultural and international dimensions

(3) biological bases of behavior and mental processes, including physiology, sensation, perception, comparative, motivation, and emotion

(4) developmental changes in behavior and mental processes across the life span

b. the history of psychology, including the evolution of methods of psychology, its theoretical conflicts, and its sociocultural contexts

c. relevant levels of analysis: cellular, individual, group/systems, and culture

d. overarching themes, persistent questions, or enduring conflicts in psychology, such as

(1) the interaction of heredity and environment

(2) variability and continuity of behavior and mental processes within and across species

(3) free will versus determinism

(4) subjective versus objective perspective

(5) the interaction of mind and body

e. relevant ethical issues, including a general understanding of the APA Code of Ethics

- (1.2) For the Sixth Edition of *Psychology*, the Hockenburys have added 1,500 new research citations, with over half of those from research no older than 2009. Along with the help of faculty, students, and expert reviewers, the Hockenburys' daily immersion in the field of psychology and contact with others in the field have been instrumental in fully representing the key content areas of psychology, including all areas emphasized in the APA report. An outline locating each of these content areas can be found in the extended table of contents (pp. viii–xix).
- (1.2a1) See Chapter 5 (Learning); also the sections "Cognitive Development" on pp. 376–382 and "Cognitive Changes" on pp. 397–398 in Chapter 9 (Lifespan Development).
- (1.2a2) In the section titled "Measuring Intelligence" in Chapter 7 (Thinking, Language, and Intelligence) on pp. 293–298, the text discusses psychometrics and individual differences. Similarly, psychological tests are discussed in Chapter 11 (Personality) on pp. 474–479.
- (1.2b) In Chapter 1, see "The Origins of Psychology" on pp. 2–9 and "Contemporary Psychology" on pp. 10–15, especially the discussion of the evolutionary perspective on pp. 12–14.
- (1.2c) Throughout Chapter 1 (Introduction and Research Methods), levels of analysis are included in the text narrative; this topic also appears in Chapter 4 (Consciousness and Its Variations), especially on pp. 137–140.
- (1.2d1) Along with the Chapter 1 discussion, persistent questions or enduring conflicts in psychology appear in Chapter 7 (Thinking, Language, and Intelligence) on pp. 298–311, in Chapter 9 (Lifespan Development) on pp. 369-370, in the In Focus box titled "Explaining Those Amazing Identical-Twin Similarities" on p. 472, and in the Chapter 14 (Psychological Disorders) discussion of genetic factors in schizophrenia on pp. 596–597.
- (1.2d2) Development across the species is part of the Chapter 9 (Lifespan Development) discussion, the Chapter 1 (Introduction and Research Methods) discussion of evolutionary psychology on pp. 12–14, the Chapter 5 (Learning) discussion on animal communication and cognition on pp. 292–293, and the Critical Thinking box titled "Emotion in Nonhuman Animals: Laughing Rats, Silly Elephants, and Smiling Dolphins?" on pp. 346–347.
- (1.2d3) Free will is addressed in the Critical Thinking box titled "Is Human Freedom Just an Illusion?" on p. 208; this in-text box also discusses Skinner's determinism as presented in the book *Beyond Freedom and Dignity.*

	• (1.2d4) Hockenbury & Hockenbury addresses subjective versus objective perspectives in Chapter 5 (Learning) on pp. 190–191. • (1.2d5) Mind-body interactions are part of the discussion in Chapter 13 (Stress, Health, and Coping), especially on pp. 533– 541; the discussion in Chapter 2 (Neuroscience and Behavior) on neuroplasticity, especially on pp. 63–64 and 66; and the discussion in Chapter 4 (Consciousness and Its Variations), especially about hypnosis on pp. 159–162 and meditation on pp. 163–165. • (1.2e) See the Chapter 1 (Introduction and Research Methods) section titled "Ethics in Psychological Research" on pp. 36–37, in particular the In Focus box feature titled "Questions About the Use of Animals in Psychological Research" on p. 37; also see the Chapter 12 (Social Psychology) section titled "Obedience" on pp. 505–511; and the in-text Critical Thinking box "Abuse at Abu Ghraib: Why Do Ordinary People Commit Evil Acts?" on pp. 512–513.
1.3 Use the concepts, language, and major theories of the discipline to account for psychological phenomena. a. Describe behavior and mental processes empirically, including operational definitions b. Identify antecedents and consequences of behavior and mental processes c. Interpret behavior and mental processes at an appropriate level of complexity d. Use theories to explain and predict behavior and mental processes e. Integrate theoretical perspectives to produce comprehensive and multi-faceted explanations	• (1.3a) The Hockenburys consistently incorporate the language and concepts of the discipline. The essential concepts and terms within the text appear in bold print, with easy-to-find definitions on the appropriate page's side column. (Also, see the Glossary in the back of the text for all the key terms, with definitions and their page references, pp. G-1–G-17.) Concepts and terms related to statistics are presented in Appendix A (Statistics: Understanding Data) on pp. A-1–A-14. Students are provided with a separate Spanish-language glossary on the companion Web page. • (1.3a–c) Hockenbury & Hockenbury maintains accessibility when introducing relevant terms and concepts. For example, see p. 277, where the concept and term "cognition" are introduced, and defined in a context students will find understandable as well as meaningful to the study of psychology; or see pp. 387–388, where "identity" is similarly introduced and defined. • (1.3d) Founders of the field are discussed in Chapter 1, pp. 3–9 and major perspectives in psychology are presented on pp. 10–14. These perspectives and related theories are linked to behavior and mental processes presented throughout the text. As an example, see Chapter 15 (Therapies) on pp. 608–628, which discusses various therapies based on psychological perspectives and theories. • (1.3e) Throughout the Hockenbury & Hockenbury text, various perspectives are presented as part of discussions on specific topics in psychology. For example, see the Chapter 8 (Motivation and Emotion) section "Theories of Emotion" on pp. 348–353, where explanations of various theories set the stage for students' understanding of behavior linked to emotions. Also, see the Chapter 11 (Personality) section titled "Two Representative Trait Theories" on pp. 468–469.
1.4 Explain major perspectives of psychology (e.g., behavioral, biological, cognitive, evolutionary, humanistic, psychodynamic, and sociocultural). a. Compare and contrast major perspectives b. Describe advantages and limitations of major theoretical perspectives	• (1.4a) All of these perspectives are outlined in the Chapter 1 (Introduction and Research Methods) section titled "Major Perspectives in Psychology" on pp. 10–14. • (1.4a–b) For specific examples of discussions of various major theoretical perspectives, see pp. 445–474 of Chapter 11 (Personality). In those pages various theoretical perspectives are applied to personality; in those same pages, advantages and limitations of different perspectives when applied to personality are summarized.
2.1 Describe the basic characteristics of the science of psychology.	• (2.1) See Chapter 1 (Introduction and Research Methods) on pp. 1–40.

2.2 Explain different research methods used by psychologists.

a. Describe how various research designs address different types of questions and hypotheses

b. Articulate strengths and limitations of various research designs

c. Distinguish the nature of designs that permit causal inferences from those that do not

- (2.2) See Chapter 1 sections titled "The Scientific Method," "Descriptive Research Methods," and "The Experimental Method" on pp. 21–33.
- (2.2a) The discussion of the different research methods in Chapter 1 includes advantages and disadvantages of each method, as well as presentations of types of questions appropriate for each method.
- (2.2c) Throughout the text, Hockenbury & Hockenbury distinguishes the nature of designs that permit causal inferences from those that don't. For example, see pp. 25–27 in the Chapter 1 section "Correlational Studies," Critical Thinking in-text boxes titled "Do Personality Factors Cause Disease?" on p. 546, "Does Smoking Cause Depression and Other Psychological Disorders?" on pp. 580–581, and several examples of experimental vs. correlational studies in Chapter 13 (Stress, Health, and Coping).

2.3 Evaluate the appropriateness of conclusions derived from psychological research.

a. Interpret basic statistical results

b. Distinguish between statistical significance and practical significance

c. Describe effect size and confidence intervals

d. Evaluate the validity of conclusions presented in research reports

- (2.3a) The interpretation of basic statistical results is addressed in Appendix A (Statistics: Understanding Data) on pp. A-1–A-14 and the Chapter 1 sections "Correlational Studies" on pp. 25–27 and "Step 3. Analyze the Data and Draw Conclusions" on pp. 19–20.
- (2.3b) For the distinction between statistical significance and practical significance, see p. 19.
- (2.2c) This goal is beyond the scope of *Psychology*.
- (2.3d) Hockenbury & Hockenbury addresses the validity of conclusions presented in research reports throughout the text. For examples, see pp. 25–27 for a critique of the Anderson & Dill (2000) experiment, the Critical Thinking in-text boxes titled "Do Personality Factors Cause Disease?" on p. 546, "Does Exposure to Media Violence *Cause* Aggressive Behavior?" on p. 223, and "Does Smoking Cause Depression and Other Psychological Disorders?" on pp. 580–581.

2.4 Design and conduct basic studies to address psychological questions using appropriate research methods.

a. Locate and use relevant databases, research, and theory to plan, conduct, and interpret results of research studies

b. Formulate testable research hypotheses, based on operational definitions of variables

c. Select and apply appropriate methods to maximize internal and external validity and reduce the plausibility of alternative explanations

d. Collect, analyze, interpret, and report data using appropriate statistical strategies to address different types of research questions and hypotheses

e. Recognize that theoretical and sociocultural contexts as well as personal biases may shape research questions, design, data collection, analysis, and interpretation

- (2.4) To help students understand the steps of research and the evaluation of conclusions, Chapter 1 (Introduction and Research Methods) provides a step-by-step explanation in the section titled "Steps in the Scientific Method."
- (2.4a) In addition to the presentation of research methods in Chapter 1, stated in the previous point, see Appendix A (Statistics: Understanding Data) on pp. A-1–A-14.
- (2.4b) Good examples of how to formulate testable research hypotheses based on operational definitions of variables can be found on pp. 18–19.
- (2.4d) In addition to coverage in Chapter 1 (Introduction and Research Methods), data are explored in a thorough but student-friendly way in Appendix A (Statistics: Understanding Data) on pp. A-1–A-14. A discussion of test construction principles (standardization, reliability, and validity) appears in Chapter 7 (Thinking, Language, and Intelligence) on pp. 297–298.
- (2.4e) As examples, see the Culture and Human Behavior in-text box "What Is Cross-Cultural Psychology?" on p. 13 and the Chapter 12 (Social Psychology) discussion of the effects of ethnocentrism, group bias, and prejudice on pp. 497–503.

2.5 Follow the APA Code of Ethics in the treatment of human and nonhuman participants in the design, data collection, interpretation, and reporting of psychological research.

- Hockenbury & Hockenbury repeatedly emphasizes the idea of ethical principles that must be followed in all psychological research.
- In addition to addressing ethics issues in the In Focus in-text box titled "Questions About the Use of Animals in Psychological Research" on p. 37, a discussion of the APA code of ethics appears in Chapter 1 (Introduction and Research Methods) on p. 36, highlighting the five key 2002 APA ethics provisions.

	• Hockenbury & Hockenbury discusses at length Milgram's experiment on obedience in Chapter 12 (Social Psychology) on pp. 505–511, with a focus on the question of ethics raised in the Critical Thinking in-text box "Abuse at Abu Ghraib: Why Do Ordinary People Commit Evil Acts?" on pp. 512–513.
2.6 Generalize research conclusions appropriately based on the parameters of particular research methods. a. Exercise caution in predicting behavior based on limitations of single studies b. Recognize the limitations of applying normative conclusions to individuals c. Acknowledge that research results may have unanticipated societal consequences d. Recognize that individual differences and sociocultural contexts may influence the applicability of research findings	• (2.6) Various research methods are evaluated in Chapter 1 (Introduction and Research Methods) on pp. 21–33. • (2.6a) The subtitle of "Case Studies" in Chapter 1, "Details, Details, Details," says it all. • (2.6b) Hockenbury & Hockenbury reminds students of the need to recognize individual variation among members of any group. For example, see the Culture and Human Behavior in-text box titled "What Is Cross-Cultural Psychology?" on p. 13. • (2.6c) Hockenbury & Hockenbury encourages students to step back and notice the significant societal implications of psychological research. This topic is explored through Chapter 12 (Social Psychology) on pp. 482–523. Another example appears in Chapter 7 (Thinking, Language, and Intelligence) in the section titled "Alfred Binet" on pp. 294–295; this section discusses Binet's intelligence test and its unanticipated later use as a tool for measuring an inborn or permanent level of intelligence, which Binet did not believe he was measuring with his test. • (2.6d) Throughout the chapters, research findings are considered in light of cultural contexts. A list of in-text box features for Culture and Human Behavior appears on pp. xxxi–xxxiii. In addition, p. xxxii presents a complete list of integrated cultural coverage topics and p. xxxiv presents a complete list of integrated gender coverage topics within the main narrative of *Psychology*.
3.1 Use critical thinking effectively. a. Evaluate the quality of information, including differentiating empirical evidence from speculation and the probable from the improbable b. Identify and evaluate the source, context, and credibility of information c. Recognize and defend against common fallacies in thinking d. Avoid being swayed by appeals to emotion or authority e. Evaluate popular media reports of psychological research f. Demonstrate an attitude of critical thinking that includes persistence, open-mindedness, tolerance for ambiguity and intellectual engagement g. Make linkages or connections between diverse facts, theories, and observations	• (3.1) To complement the powerful and student-friendly narrative of the Hockenbury & Hockenbury text are in-text Critical Thinking boxes, which appear throughout *Psychology*. A list of these critical thinking topics can be found on p. xxxi. • (3.1a) To help students evaluate the quality of information, the narrative approach is complemented with Science Versus Pseudoscience in-text box features. For example, Chapter 1 (Introduction and Research Methods) includes a Science Versus Pseudoscience in-text box titled "What Is a Pseudoscience?" on p. 22. Topics for other Science Versus Pseudoscience in-text boxes can be found on p. xxx–xxxi. • (3.1b) To help students evaluate sources, Chapter 1 includes an Enhancing Well-Being with Psychology feature titled "Psychology in the Media: Becoming an Informed Consumer" on pp. 38–39. • (3.1c) See the Critical Thinking in-text boxes titled "The Persistence of Unwarranted Beliefs" on p. 288 and "ESP: Can Perception Occur Without Sensation?" on pp. 114–115. • (3.1e) The evaluation of popular media reports or psychological research is addressed in the aforementioned Chapter 1 Enhancing Well-Being with Psychology feature titled "Psychology in the Media: Becoming an Informed Consumer" on pp. 38–39 and in a Critical Thinking in-text box titled "'His' and 'Her' Brains?" on p. 74. • (3.1f) Hockenbury & Hockenbury emphasizes critical thinking attitudes with questions that ask students to actively consider the evidence of different points of view; these questions conclude each Critical Thinking in-text box feature. For example, see the questions that conclude the Critical Thinking boxes titled "Does Exposure to Media Violence *Cause* Aggressive Behavior?" on p. 223 and "The Effects of Child Care on Attachment and Development" on p. 396.

	• (3.1g) The Hockenburys actively connect diverse elements throughout the text. In the Critical Thinking in-text box "Is Hypnosis a Special State of Consciousness?" on p. 162, are presented with three competing theories, and observational evidence is interpreted in different ways. See also "Applications of Observational Learning" on pp. 222–224.
3.2 Engage in creative thinking. a. Intentionally pursue unusual approaches to problems b. Recognize and encourage creative thinking and behaviors in others c. Evaluate new ideas with an open but critical mind	• (3.2a–c) Hockenbury & Hockenbury gives students tools for exploring new problem-solving methods; this concept is highlighted in the Chapter 7 (Thinking, Language, and Intelligence) Enhancing Well-Being with Psychology section titled "A Workshop on Creativity" on pp. 312–313.
3.3 Use reasoning to recognize, develop, defend, and criticize arguments and other persuasive appeals. a. Identify components of arguments (e.g., conclusions, premises/assumptions, gaps, counterarguments) b. Distinguish among assumptions, emotional appeals, speculations, and defensible evidence c. Weigh support for conclusions to determine how well reasons support conclusions d. Identify weak, contradictory, and inappropriate assertions e. Develop sound arguments based on reasoning and evidence	• (3.3c) The Hockenburys' focus in the following Critical Thinking in-text boxes addresses reasoned conclusions: "What Is Critical Thinking?" on p. 18, "Does Exposure to Media Violence *Cause* Aggressive Behavior?" on pp. 224–225, and "The Effects of Child Care on Attachment and Development" on p. 396.
3.4 Approach problems effectively. a. Recognize ill-defined and well-defined problems b. Articulate problems clearly c. Evaluate the quality of solutions and revise as needed d. Generate multiple possible goals and solutions e. Select and carry out the best solution	• (3.4) See Chapter 7 (Thinking, Language, and Intelligence), especially pp. 277–287, in which building blocks of thought as well as problem-solving strategies, obstacles to solving problems, and decision-making strategies are explored.
4.1 Describe major applied areas of psychology (e.g., clinical, counseling, industrial/organizational, school, health).	• (4.1) Hockenbury & Hockenbury graphically illustrates the variety of specialty areas and employment settings for psychologists in Figure 1.1 on p. 14. Descriptions for these applied areas of psychology are presented in the Chapter 1 (Introduction and Research Methods) section titled "Specialty Areas in Psychology." • Chapter 13 (Stress, Health, and Coping) discusses the work of health psychologists. • Chapter 15 (Therapies) not only addresses the work of psychologists involved in psychotherapy and biomedical therapy, but also presents a table on p. 609 that delineates who's who among mental health professionals. • Hockenbury & Hockenbury also covers industrial/organizational (I/O) psychology in Appendix B (Industrial/Organizational Psychology) on pp. B-1–B-15.
4.2 Identify appropriate applications of psychology in solving problems, such as a. the pursuit and effect of healthy lifestyles b. origin and treatment of abnormal behavior c. psychological tests and measurements d. psychology-based interventions in clinical, counseling, educational, industrial/organizational, community, and other settings and their empirical evaluation	• (4.2a) An application in-text box titled "Minimizing the Effects of Stress" on pp. 555–556 addresses the pursuit of healthy lifestyles. • (4.2b) The origins and treatment of abnormal behavior is covered extensively and in-depth in Chapter 14 (Psychological Disorders) on pp. 560–603 and Chapter 15 (Therapies) on pp. 608–646. • (4.2c) Chapter 7 (Thinking, Language, and Intelligence) presents a section titled "Principles of Test Construction" on pp. 297–298, and Chapter 11 (Personality) presents a section titled "Assessing Personality" on pp. 474–478 to address psychological tests and measurements.

	• (4.2d) Chapter 15 (Therapies) provides a discussion of various therapies; a broad range of issues related to the efficacy of psychotherapy is addressed in the section titled "Evaluating the Effectiveness of Psychotherapy" on pp. 629–634.
4.3 Articulate how psychological principles can be used to explain social issues and inform public policy. a. Recognize that sociocultural contexts may influence the application of psychological principles in solving social problems b. Describe how applying psychological principles can facilitate change	• (4.3a) Hockenbury & Hockenbury provides insight into sociocultural contexts that influence the application of applying psychological principles to solving social problems in a Culture and Human Behavior in-text box titled "Cultural Values and Psychotherapy" on p. 634. • (4.3b) In Chapter 12 (Social Psychology), a section titled "Overcoming Prejudice" on pp. 501–502 discusses how psychological principles may be engaged in the facilitation of social change and development of public policy.
4.4 Apply psychological concepts, theories, and research findings as these relate to everyday life.	• Throughout the text, the authors help students apply psychological concepts to everyday life. The Enhancing Well-Being with Psychology in-text box features in every chapter present research-based information in a form that students can use to enhance daily functioning. The full range of titles for Enhancing Well-Being with Psychology boxes is listed on p. xxxv.
4.5 Recognize that ethically complex situations can develop in the application of psychological principles.	• The Hockenburys openly discuss ethically complex situations that can result from applying psychological research, such as the understanding of the nature/nurture balance, which is introduced on p. 3, or the power of attributions, which is addressed on pp. 490–493.
5.1 Recognize the necessity for ethical behavior in all aspects of the science and practice of psychology.	• Hockenbury & Hockenbury places a focus on ethics in Chapter 1 (Introduction and Research Methods), in particular the section titled "Ethics in Psychological Research" on pp. 36–37 and the In Focus in-text box feature titled "Questions About the Use of Animals in Psychological Research" on p. 37. • Ethics are also addressed in discussions of Milgram's experiments on obedience in Chapter 12 (Social Psychology) on pp. 486–521, accompanied by the Critical Thinking in-text box titled "Abuse at Abu Ghraib: Why Do Ordinary People Commit Evil Acts?" on pp. 512–513. Like all other Critical Thinking in-text boxes throughout the text, this one ends with questions that probe and hone students' critical thinking abilities.
5.2 Demonstrate reasonable skepticism and intellectual curiosity by asking questions about causes of behavior.	• In Chapter 1 (Introduction and Research Methods) students are asked to use reason along with curiosity to ask questions about behavior, and this approach is emphasized in the Science Versus Pseudoscience in-text box titled "What Is a Pseudoscience?" on p. 22. • Intellectual curiosity and reasonable skepticism about behavior are probed through topics and questions in the Critical Thinking in-text boxes that appear throughout the Hockenbury & Hockenbury text. These boxes encourage students to think about the broader implications of psychological research—to strengthen and refine their critical thinking skills by developing their own positions on questions and issues that don't always have simple answers. The full range of topics and titles for Critical Thinking features are listed on p. xxxi.

5.3 Seek and evaluate scientific evidence for psychological claims.	• The Hockenburys' *Psychology* evaluates scientific evidence for psychological claims on a variety of topics in the Science Versus Pseudoscience in-text box features that appear throughout the text. With this box feature, students learn the importance of subjecting various claims to standards of scientific evidence. In addition, these boxes encourage scientific thinking by focusing on topics that students frequently ask about in class. The full range of topics and titles of this feature are listed on p. xxx.
5.4 Tolerate ambiguity and realize that psychological explanations are often complex and tentative.	• Psychological explanations are often complex and tentative, to the extent that numerous examples of ambiguities are addressed throughout the chapters in *Psychology*, Sixth Edition—for instance, the discussion in the Chapter 10 (Gender and Sexuality) section titled "Sexual Orientation" on pp. 423–426. Critical Thinking in-text boxes "The Memory Wars: Recovered or False Memories?" (p. 259) and "Is Hypnosis a Special State of Consciousness?" (p. 162) point to continuing debate. See also the Chapter 14 (Psychological Disorders) section titled "Explaining Schizophrenia" on pp. 596–601.
5.5 Recognize and respect human diversity and understand that psychological explanations may vary across populations and contexts.	• Issues of human diversity and variations across populations and cultures are addressed throughout the text, for example, in explanations based on cultural contexts on p. 12 (the caption on social striving), p. 542 (the section titled "Personal Control"), and pp. 572–574 (the section titled "Obsessive-Compulsive Disorder").
5.6 Assess and justify their engagement with respect to civic, social, and global responsibilities.	• Throughout the Hockenbury & Hockenbury narrative and also in the accompanying in-text box features, students gauge behavior and mental processes in their own personal lives, the lives of family members, friends, and community members, both local and worldwide. The immediate and personal concerns of individuals make up the content of the chapter prologues, while broader civic and/or social concerns are often the focus of in-text box features, such as the Culture and Human Behavior in-text boxes titled "What Is Cross-Cultural Psychology?" on p. 13, "The Effect of Language on Perception" on pp. 290–291, and "Explaining Failure and Murder: Culture and Attributional Biases" on p. 492.
5.7 Understand the limitations of their psychological knowledge and skills.	• Hockenbury & Hockenbury notes (about theories in psychology) that students should remember the "self-correcting nature of the scientific enterprise" as "new research findings challenge established ways of thinking about a phenomenon. . . ." (p. 21).
6.1 Demonstrate information competence at each stage in the following process: a. Formulate a researchable topic that can be supported by database search strategies b. Locate and choose relevant sources from appropriate media, which may include data and perspectives outside traditional psychology and Western boundaries c. Use selected sources after evaluating their suitability based on: • appropriateness, accuracy, quality, and value of the source • potential bias of the source • the relative value of primary versus secondary sources, empirical versus non-empirical sources, and peer-reviewed versus nonpeer-reviewed sources d. Read and accurately summarize the general scientific literature of psychology	• (6.1) On pp. 16–21 of Chapter 1 (Introduction and Research Methods), Hockenbury & Hockenbury outlines the scientific method step by step, from formulating a specific question that can be tested to designing a study to collect relevant data, analyze the data to arrive at conclusions, and report the results. Throughout the text, Hockenbury & Hockenbury discusses research that satisfies the described elements of competence.

6.2 Use appropriate software to produce understandable reports of the psychological literature, methods, and statistical and qualitative analyses in APA or other appropriate style, including graphic representations of data.	• (6.2) Hockenbury & Hockenbury addresses methods in Chapter 1 (Introduction and Research Methods) and provides a helpful discussion of statistical analyses in Appendix A (Statistics: Understanding Data) on pp. A-1–A-14. • On p. 20 of Chapter 1 (Introduction and Research Methods), students learn how to read a journal and report findings with correct citation formatting. • The student Web site includes a link to Diana Hacker's *Research and Documentation*, which provides detailed instruction on finding and documenting sources.
6.3 Use information and technology ethically and responsibly. a. Quote, paraphrase, and cite correctly from a variety of media sources b. Define and avoid plagiarism c. Avoid distorting statistical results d. Honor commercial and intellectual copyrights	• (6.3) When describing studies or referencing ideas, Hockenbury & Hockenbury takes care to demonstrate ethical and responsible use of information; all such material is consistently quoted or cited, allowing students to become familiar with appropriate levels of attribution. • (6.3a) Page 20, Figure 1.2, provides a visual guide to reading a journal reference; the caption links the details of a reference to source citations. • (6.3c) On pp. 19–20, Hockenbury & Hockenbury reviews how meta-analysis is used to reveal overall trends that may not be evident in individual studies. The Chapter 6 (Memory) discussion about memory distortions on pp. 255–259 also serves as a caution.
6.4 Demonstrate these computer skills: a. Use basic word processing, database, email, spreadsheet, and data analysis programs b. Search the World Wide Web for high-quality information c. Use proper etiquette and security safeguards when communicating through email	• A companion Web site developed exclusively for the Hockenbury & Hockenbury text allows instructors and students to hone computer skills while reviewing key concepts. See www.worthpublishers.com/hockenbury6e.
7.1 Demonstrate effective writing skills in various formats (e.g., essays, correspondence, technical papers, note taking) and for various purposes (e.g., informing, defending, explaining, persuading, arguing, teaching). a. Demonstrate professional writing conventions (e.g., grammar, audience awareness, formality) appropriate to purpose and context b. Use APA style effectively in empirically-based reports, literature reviews, and theoretical papers	• (7.1a–b) The Critical Thinking in-text box features that appear throughout *Psychology*, Sixth Edition, provide students with opportunities to write responses to thought-provoking questions. Those responses demand critical thinking as well as a good command of writing skills. • On p. 20 of Chapter 1 (Introduction and Research Methods), students learn how to read a journal reference (Figure 1.2, "How to Read a Journal Reference") and report findings with correct citation formatting.
7.2 Demonstrate effective oral communication skills in various formats (e.g., group discussion, debate, lecture) and for various purposes (e.g., informing, defending, explaining, persuading, arguing, teaching).	• In addition to writing responses to thought-provoking questions that conclude the Critical Thinking in-text boxes that appear throughout the text, students also have the opportunity to respond to those questions orally in order to explain, persuade, or inform listeners. • The Instructor's Resource Manual, available to all instructors using *Psychology*, also presents numerous classroom activities that work to develop students' oral communication skills. Suggested activities include role-playing scenarios, presentations, group discussions and exercises, and debates, among other formats. For example, a group decisions and stereotyping activity on page 22 of Chapter 12 in the Instructor's Resource Manual proposes a difficult scenario, then asks students to attempt to gain consensus about it among members of their group.

7.3 Exhibit quantitative literacy.

a. Apply basic mathematical concepts and operations to support measurement strategies

b. Use relevant probability and statistical analyses to facilitate interpretation of measurements

c. Articulate clear and appropriate rationale for choice of information conveyed in charts, tables, figures, and graphs

d. Interpret quantitative visual aids accurately, including showing vigilance about misuse or misrepresentation of quantitative information

- (7.3a) Hockenbury & Hockenbury provides Appendix A (Statistics: Understanding Data) on pp. A-1–A-14 to introduce mathematics that researchers use to organize and interpret data.
- (7.3b) Appendix A contains graphic presentations of data (from histograms and frequency polygons to standard normal curves and scatter diagrams). This appendix includes "A Frequency Distribution Table" on p. A-3 and a "Calculating the Standard Deviation" table on p. A-7.
- (7.3c–d) Appendix A ends with a discussion of inferential statistics in which the author cautions students of the ". . . small but real possibility of *erroneously* concluding that study results are significant" (p. A-12).

7.4 Demonstrate effective interpersonal communication skills.

a. Listen accurately and actively

b. Use psychological concepts and theory to understand interactions with others

c. Identify the impact or potential impact of their behaviors on others

d. Articulate ideas thoughtfully and purposefully

e. Use appropriately worded questions to improve interpersonal understanding

f. Attend to nonverbal behavior and evaluate its meaning in the communications context

g. Adapt communication style to accommodate diverse audiences

h. Provide constructive feedback to colleagues in oral and written formats

- (7.4b–c) In Chapter 8 (Motivation and Emotion), Hockenbury discusses how people who rate high in emotional intelligence "are able to understand and use their emotions" to help motivate themselves (p. 339).
- (7.4d–e) Pages 21–22 point out how articulated ideas and appropriately worded questions are part of naturalistic observation.
- (7.4e) The Enhancing Well-Being with Psychology feature throughout the text promotes interpersonal understanding as well as self-understanding that can be articulated. For instance, the Enhancing Well-Being with Psychology feature titled "Using Learning Principles to Improve Self-Control" on pp. 226–227 provides students with strategies that work as short-term and long-term reinforcers to help attain a behavior goal.
- (7.4f) Chapter 8 (Motivation and Emotion) includes a section titled "The Expression of Emotion" on pp. 345–348 that focuses on nonverbal behavior communicated by people (universal expressions and cultural expressions) and animals—the latter of which is the topic of a Critical Thinking in-text box titled "Emotion in Nonhuman Animals: Laughing Rats, Silly Elephants, and Smiling Dolphins?" on pp. 346–347.

7.5 Exhibit the ability to collaborate effectively.

a. Work with groups to complete projects within reasonable timeframes

b. Solicit and integrate diverse viewpoints

c. Manage conflicts appropriately and ethically

d. Develop relevant workplace skills: mentoring, interviewing, crisis management

- Hockenbury & Hockenbury discusses competence and achievement motivation in Chapter 8 (Motivation and Emotion).
- In Appendix B (Industrial/Organizational Psychology) on pp. B-1–B-15, Hockenbury & Hockenbury presents issues and concepts related to collaborative efforts in the workplace. In particular, leadership roles are addressed in the section on Organizational Behavior on pp. B-7–B-10, with an In Focus in-text box feature titled "Servant Leadership: When It's Not All About You" on p. B-10.
- For students who hope to affect how people work together, Appendix B offers a detailed exploration about the professions of industrial/organizational psychology.

8.1 Interact effectively and sensitively with people from diverse backgrounds and cultural perspectives.

- In *Psychology*, Sixth Edition, the Hockenburys often and consistently present perspectives based on people's diverse backgrounds and various cultural perspectives, and the topics of Integrated Cultural Coverage are listed on p. xxxii.
- In addition to the discussions within the text narrative, Hockenbury & Hockenbury focuses on cultural perspectives in the Culture and Human Behavior in-text box feature that accompanies the main text narrative. A listing of the topics of those in-text box features is found on pp. xxxiii.
- Gender-related topics and issues are discussed throughout the chapters of *Psychology*. A listing of topics for Integrated Gender Coverage can be found on p. xxxiv.

8.2 Examine the sociocultural and international contexts that influence individual differences.	• Hockenbury & Hockenbury often and consistently presents perspectives based on people's diverse backgrounds and perspectives. The specific topics of Integrated Cultural Coverage are listed on p. xxxii. • In addition to the discussions within the text narrative, Hockenbury & Hockenbury focuses on cultural perspectives in the Culture and Human Behavior in-text boxes that accompany the main text narrative. A listing of the topics of those in-text box features is found on pp. xxxii.
8.3 Explain how individual differences influence beliefs, values, and interactions with others and vice versa.	• Gender-related topics and issues are discussed throughout the chapters of *Psychology* and a listing of topics for Integrated Gender Coverage can be found on p. xxxiv. • Individual differences as they affect human interactions are explored in the Chapter 12 (Social Psychology) Culture and Human Behavior in-text box feature titled "Explaining Failure and Murder: Culture and Attributional Biases" on p. 492, in discussions within Chapter 8 (Motivation and Emotion) on competence and achievement motivation on pp. 336–337, and in culture and emotional expression on p. 346.
8.4 Understand how privilege, power, and oppression may affect prejudice, discrimination, and inequity.	• See "Understanding Prejudice," a section of Chapter 12 (Social Psychology), on pp. 497–501.
8.5 Recognize prejudicial attitudes and discriminatory behaviors that might exist in themselves and others.	• See the section titled "Attribution" on pp. 490–493 and "The Social Psychology of Attitudes" on pp. 493–497; both of which are part of Chapter 12 (Social Psychology).
9.1 Reflect on their experiences and find meaning in them. a. Identify their personal and professional values b. Demonstrate insightful awareness of their feelings, emotions, motives, and attitudes based on psychological principles	• (9.1a) The questions that Hockenbury & Hockenbury poses at the conclusion of each in-text box feature on Critical Thinking invite students to consider how the material reflects on their own lives. For example, personal and professional values are explored as students respond to a concluding question in "'His' and 'Her' Brains?" on p. 74: "Why is the notion that sex differences might be due to brain differences so appealing to many people?" • (9.1b) Insight based on psychological principles is the focus of the concluding questions of the Critical Thinking in-text box feature titled "Freud Versus Rogers on Human Nature" on p. 461: ". . . are people naturally good, as Rogers claimed? If people existed in a truly free and nurturing environment, would they invariably make constructive choices that would benefit both themselves and society as a whole?"
9.2 Apply psychological principles to promote personal development. a. Demonstrate self-regulation in setting and achieving goals b. Self-assess performance quality accurately c. Incorporate feedback for improved performance d. Purposefully evaluate the quality of one's thinking (metacognition)	• (9.2a–d) The Enhancing Well-Being with Psychology feature at the end of all chapters of Psychology, Sixth Edition, provides students opportunities to set goals and perform self-assessment and self-evaluation of their own thinking. In particular, see: "Maximizing Your Brain's Potential" on pp. 81–82 "Strategies to Control Pain" on pp. 128–129 "Stimulus Control Therapy for Insomnia" on pp. 178–179 "Using Learning Principles to Improve Self-Control" on pp. 226–227 "Superpower Memory in Minutes per Day!" on pp. 270–271 "A Workshop on Creativity" on pp. 312–313 "Turning Your Goals into Reality" on pp. 354–355 "Raising Psychologically Healthy Children" on pp. 401–402 "Possible Selves: Imagine the Possibilities" pp. 479–480 "The Persuasion Game" on pp. 520–521 "Minimizing the Effects of Stress" on pp. 555–556 "Understanding and Helping to Prevent Suicide" on pp. 602–603

	• (9.2a) The Enhancing Well-Being with Psychology features "Using Learning Principles to Improve Self-Control" on pp. 226–227 and "Turning Your Goals into Reality" on pp. 354–355 encourage self-regulation in setting and achieving goals.
9.3 Enact self-management strategies that maximize healthy outcomes.	• See the listed Enhancing Well-Being with Psychology features above, many of which provide self-management strategies that maximize healthy outcomes—in particular, see "Strategies to Control Pain" on pp. 128–129, "Stimulus Control Therapy for Insomnia" on pp. 178–179, "Minimizing the Effects of Stress" on pp. 555–556, and "Understanding and Helping to Prevent Suicide" on pp. 602–604. • See the Chapter 8 (Motivation and Emotion) section titled "Motivational Concepts and Theories" on pp. 319–322. • Also see the Chapter 12 sections "Individual Factors That Influence the Response to Stress" on pp. 541–546 and "Coping" on pp. 549–554.
9.4 Display high standards of personal integrity with others.	• On pp. 371–372 of Chapter 9 (Lifespan Development) Hockenbury & Hockenbury points out research that indicates a long-term outlook for securely attached children: as preschoolers, they tend to be more prosocial, empathetic, and socially competent; as middle schoolers, they have higher levels of development, socially and cognitively; as adolescents, they have fewer problems, do better in school, and have more successful relationships with their peers.
10.1 Apply knowledge of psychology (e.g., decision strategies, life span processes, psychological assessment, types of psychological careers) to formulating career choices.	• The Chapter 1 (Introduction and Research Methods) section titled "Specialty Areas in Psychology" on pp. 14–16 describes the different specialty areas and employment settings. • Appendix B (Industrial/Organization Psychology) on pp. B-1–B-15 explores this field of psychology, along with a variety of careers linked to it.
10.2 Identify the types of academic experience and performance in psychology and the liberal arts that will facilitate entry into the work force, post-baccalaureate education, or both.	• The pie chart in Figure 1.1 on p. 14 points out employment settings and specialty areas for psychologists who have recently received doctorates.
10.3 Describe preferred career paths based on accurate self-assessment of abilities, achievement, motivation, and work habits.	• Principles outlined in the Enhancing Well-Being with Psychology feature titled "Turning Your Goals into Reality" on pp. 354–355 help students develop strategies for motivation and achievement.
10.4 Identify and develop skills and experiences relevant to achieving selected career goals.	• As noted above, principles outlined in the Enhancing Well-Being with Psychology feature titled "Turning Your Goals into Reality" on pp. 354–355 help students develop strategies to achieve goals.
10.5 Demonstrate an understanding of the importance of lifelong learning and personal flexibility to sustain personal and professional development as the nature of work evolves.	• The Hockenburys demonstrate the importance of hard work, learning, flexibility, and creativity throughout the chapters in *Psychology*. For examples, note the discussion in Chapter 8 (Motivation and Emotion) in the section titled "Motivational Concepts and Theories" on pp. 319–322 and the Enhancing Well-Being with Psychology feature titled "A Workshop on Creativity" on pp. 312–313.

GLOSSARY

A

absolute threshold The smallest possible strength of a stimulus that can be detected half the time. (p. 90)

accommodation The process by which the lens changes shape to focus incoming light so that it falls on the retina. (p. 94)

acculturative stress (ah-CUL-chur-uh-tiv) The stress that results from the pressure of adapting to a new culture. (p. 534)

acetylcholine (uh-*seet*-ull-KO-leen) Neurotransmitter that causes muscle contractions and is involved in learning and memory. (p. 52)

achievement motivation The desire to direct your behavior toward excelling, succeeding, or outperforming others at some task. (p. 336)

achievement test A test designed to measure a person's level of knowledge, skill, or accomplishment in a particular area. (p. 297)

action potential A brief electrical impulse by which information is transmitted along the axon of a neuron. (p. 47)

activation–synthesis model of dreaming The theory that brain activity during sleep produces dream images (*activation*), which are combined by the brain into a dream story (*synthesis*). (p. 152)

activity theory of aging The psycho-social theory that life satisfaction in late adulthood is highest when people maintain the level of activity they displayed earlier in life. (p. 398)

actualizing tendency In Rogers's theory, the innate drive to maintain and enhance the human organism. (p. 460)

acupuncture Ancient Chinese medical procedure involving the insertion and manipulation of fine needles into specific locations on the body to alleviate pain and treat illness; modern acupuncture sometimes involves sending electrical current through the needles rather than manipulating them. (p. 128)

adipose tissue Body fat that is the main source of stored, or reserve, energy. (p. 323)

adolescence The transitional stage between late childhood and the beginning of adulthood, during which sexual maturity is reached. (p. 382)

adolescent growth spurt The period of accelerated growth during puberty, involving rapid increases in height and weight. (p. 383)

adrenal cortex The outer portion of the adrenal glands. (p. 61)

adrenal glands Pair of endocrine glands that are involved in the human stress response. (p. 61)

adrenal medulla The inner portion of the adrenal glands; secretes epinephrine and norepinephrine. (p. 61)

afterimage A visual experience that occurs after the original source of stimulation is no longer present. (p. 99)

agonist Drug or other chemical substance that binds to a receptor site and triggers a response in the cell. (p. 54)

agoraphobia An anxiety disorder involving the extreme and irrational fear of experiencing a panic attack in a public situation and being unable to escape or get help. (p. 568)

AIDS (acquired immune deficiency syndrome) Disease caused by the *human immunodeficiency virus* (HIV), which selectively attacks helper T cells in the immune system, progressively weakening the body's ability to fight infections and diseases. (p. 434)

algorithm A problem-solving strategy that involves following a specific rule, procedure, or method that inevitably produces the correct solution. (p. 282)

allele (ah-LEEL) One of the different forms of a particular gene. (p. 363)

all-or-none law The principle that either a neuron is sufficiently stimulated and an action potential occurs or a neuron is not sufficiently stimulated and an action potential does not occur. (p. 48)

alpha brain waves Brain-wave pattern associated with relaxed wakefulness and drowsiness. (p. 142)

altruism Helping another person with no expectation of personal reward or benefit. (p. 514)

Alzheimer's disease (AD) A progressive disease that destroys the brain's neurons, gradually impairing memory, thinking, language, and other cognitive functions, resulting in the complete inability to care for oneself; the most common cause of *dementia*. (p. 268)

amnesia (am-NEE-zha) Severe memory loss. (p. 265)

amphetamines (am-FET-uh-meens) A class of stimulant drugs that arouse the central nervous system and suppress appetite. (p. 173)

amplitude The intensity or amount of energy of a wave, reflected in the height of the wave; the amplitude of a sound wave determines a sound's loudness. (p. 101)

amygdala (uh-MIG-dull-uh) Almond-shaped cluster of neurons in the brain's temporal lobe, involved in memory and emotional responses, especially fear. (pp. 73, 342)

animal cognition or comparative cognition The study of animal learning, memory, thinking, and language. (p. 293)

anorexia nervosa An eating disorder characterized by excessive weight loss, an irrational fear of gaining weight, and distorted body self-perception. (p. 582)

antagonist Drug or other chemical substance that blocks a receptor site and inhibits or prevents a response in the receiving cell. (p. 55)

anterograde amnesia Loss of memory caused by the inability to store new memories; forward-acting amnesia. (p. 264)

anthropomorphism The attribution of human traits, motives, emotions, or behaviors to nonhuman animals or inanimate objects. (p. 347)

antianxiety medications Prescription drugs that are used to alleviate the symptoms of anxiety. (p. 638)

antidepressant medications Prescription drugs that are used to reduce the symptoms associated with depression. (p. 640)

antipsychotic medications (*an*-tee-sy-KOT-ick or anti-si-KOT-ick) Prescription drugs that are used to reduce psychotic symptoms; frequently used in the treatment of schizophrenia; also called *neuroleptics*. (p. 636)

antisocial personality disorder A personality disorder characterized by a pervasive pattern of disregarding and violating the rights of others; such individuals are also often referred to as *psychopaths* or *sociopaths*. (p. 586)

anxiety An unpleasant emotional state characterized by physical arousal and feelings of tension, apprehension, and worry. (p. 567)

anxiety disorders A category of psychological disorders in which extreme anxiety is the main diagnostic feature and causes significant disruptions in the person's cognitive, behavioral, or interpersonal functioning. (p. 566)

aphasia (uh-FAZE-yuh) The partial or complete inability to articulate ideas or understand spoken or written language because of brain injury or damage. (p. 75)

aptitude test A test designed to assess a person's capacity to benefit from education or training. (p. 297)

archetypes (AR-kuh-types) In Jung's theory, the inherited mental images of universal human instincts, themes, and preoccupations that are the main components of the collective unconscious. (p. 455)

arousal theory The view that people are motivated to maintain a level of arousal that is optimal—neither too high nor too low. (p. 321)

Asperger's syndrome Behavioral syndrome characterized by varying degrees of difficulty in social and conversational skills but normal-to-above-average intelligence and language development; often accompanied by obsessive preoccupation with particular topics or routines. (p. 302)

attachment The emotional bond that forms between an infant and caregiver(s), especially his or her parents. (p. 371)

attention The capacity to selectively focus awareness on particular stimuli in your external environment or on your internal thoughts or sensations. (p. 135)

attitude A learned tendency to evaluate some object, person, or issue in a particular way; such evaluations may be positive, negative, or ambivalent. (p. 494)

attribution The mental process of inferring the causes of people's behavior, including one's own. Also refers to the explanation made for a particular behavior. (p. 491)

atypical antipsychotic medications Newer antipsychotic medications that, in contrast to the early antipsychotic drugs, block dopamine receptors in brain regions associated with psychotic symptoms rather than more globally throughout the brain, resulting in fewer side effects. (p. 638)

audition The technical term for the sense of hearing. (p. 101)

authoritarian parenting style Parenting style in which parents are demanding and unresponsive toward their children's needs or wishes. (p. 401)

authoritative parenting style Parenting style in which parents set clear standards for their children's behavior but are also responsive to their children's needs and wishes. (p. 402)

autism Behavioral syndrome associated with differences in brain functioning and sensory responses, and characterized by impaired social interaction, impaired verbal and nonverbal communication skills, repetitive or odd motor behaviors, and highly restricted interests and routines. (p. 302)

autonomic nervous system (aw-toe-NOM-ick) Subdivision of the peripheral nervous system that regulates involuntary functions. (p. 58)

availability heuristic A strategy in which the likelihood of an event is estimated on the basis of how readily available other instances of the event are in memory. (p. 287)

aversive conditioning A relatively ineffective type of behavior therapy that involves repeatedly pairing an aversive stimulus with the occurrence of undesirable behaviors or thoughts. (p. 619)

axon The long, fluid-filled tube that carries a neuron's messages to other body areas. (p. 45)

axon terminals Branches at the end of the axon that contain tiny pouches, or sacs, called synaptic vesicles. (p. 50)

B

barbiturates (barb-ITCH-yer-ets) A category of depressant drugs that reduce anxiety and produce sleepiness. (p. 170)

basal metabolic rate (BMR) When the body is at rest, the rate at which it uses energy for vital functions, such as heartbeat and respiration. (p. 323)

basic emotions The most fundamental set of emotion categories, which are biologically innate, evolutionarily determined, and culturally universal. (p. 339)

basilar membrane (BAZ-uh-ler or BAZE-uh-ler) The membrane within the cochlea of the ear that contains the hair cells. (p. 103)

behavior modification The application of learning principles to help people develop more effective or adaptive behaviors. (p. 212)

behavior therapy A type of psychotherapy that focuses on directly changing maladaptive behavior patterns by using basic learning principles and techniques; also called *behavior modification*. (p. 616)

behavioral genetics An interdisciplinary field that studies the effects of genes and heredity on behavior. (p. 470)

behavioral theories of leader effectiveness Theories of leader effectiveness that focus on differences in the behaviors of effective and ineffective leaders. (p. B-8)

behaviorism School of psychology and theoretical viewpoint that emphasizes the study of observable behaviors, especially as they pertain to the process of learning. (pp. 8, 190)

beta brain waves Brain-wave pattern associated with alert wakefulness. (p. 142)

binocular cues (by-NOCK-you-ler) Distance or depth cues that require the use of both eyes. (p. 118)

biofeedback Technique that involves using auditory or visual feedback to learn to exert voluntary control over involuntary body functions, such as heart rate, blood pressure, blood flow, and muscle tension. (p. 128)

biological preparedness In learning theory, the idea that an organism is innately predisposed to form associations between certain stimuli and responses. (p. 198)

biological psychology Specialized branch of psychology that studies the relationship between behavior and bodily processes and systems; also called *biopsychology* or *psychobiology*. (p. 44)

biomedical therapies The use of medications, electroconvulsive therapy, or other medical treatments to treat the symptoms associated with psychological disorders. (p. 608)

biopsychosocial model The belief that physical health and illness are determined by the complex interaction of biological, psychological, and social factors. (p. 529)

bipolar cells In the retina, the specialized neurons that connect the rods and cones with the ganglion cells. (p. 95)

bipolar disorder A mood disorder involving periods of incapacitating depression alternating with periods of extreme euphoria and excitement; formerly called *manic depression*. (p. 578)

blaming the victim The tendency to blame an innocent victim of misfortune for having somehow caused the problem or for not having taken steps to avoid or prevent it. (p. 491)

blind spot The point at which the optic nerve leaves the eye, producing a small gap in the field of vision. (p. 95)

body mass index (BMI) A numerical scale indicating adult height in relation to weight; calculated as $(703 \times \text{weight in pounds})/(\text{height in inches})^2$. (p. 328)

borderline personality disorder A personality disorder characterized by instability of interpersonal relationships, self-image, and emotions, and marked impulsivity. (p. 587)

bottom-up processing Information processing that emphasizes the importance of the sensory receptors in detecting the basic features of a stimulus in the process of recognizing a whole pattern; analysis that moves from the parts to the whole; also called *data-driven processing*. (p. 112)

brainstem A region of the brain made up of the hindbrain and the midbrain. (p. 67)

brightness The perceived intensity of a color, which corresponds to the amplitude of the light wave. (p. 98)

bulimia nervosa An eating disorder characterized by binges of extreme overeating followed by self-induced vomiting, misuse of laxatives, or other inappropriate methods to purge the excessive food and prevent weight gain. (p. 583)

burnout An unhealthy condition caused by chronic, prolonged work stress that is characterized by exhaustion, cynicism, and a sense of failure or inadequacy. (p. 532)

bystander effect A phenomenon in which the greater the number of people present, the less likely each individual is to help someone in distress. (p. 516)

C

cafeteria diet effect The tendency to eat more when a wide variety of palatable foods is available. (p. 329)

caffeine (kaff-EEN) A stimulant drug found in coffee, tea, cola drinks, chocolate, and many over-the-counter medications. (p. 172)

California Psychological Inventory (CPI) A self-report inventory that assesses personality characteristics in normal pop-ulations. (p. 477)

case study An intensive study of a single individual or small group of individuals. (p. 23)

cataplexy A sudden loss of voluntary muscle strength and control that is usually triggered by an intense emotion. (p. 156)

catecholamines (cat-eh-COLE-uh-meens) Hormones secreted by the adrenal medulla that cause rapid physiological arousal; include adrenaline and noradrenaline. (p. 535)

cell body Processes nutrients and provides energy for the neuron to function; contains the cell's nucleus; also called the *soma*. (p. 45)

central nervous system (CNS) Division of the nervous system that consists of the brain and spinal cord. (p. 56)

centration In Piaget's theory, the tendency to focus, or *center*, on only one aspect of a situation and ignore other important aspects of the situation. (p. 378)

cerebellum (sare-uh-BELL-um) A large, two-sided hindbrain structure at the back of the brain; responsible for muscle coordination and maintaining posture and equilibrium. (p. 68)

cerebral cortex (suh-REE-brull or SARE-uh-brull) The wrinkled outer portion of the forebrain, which contains the most sophisticated brain centers. (p. 69)

cerebral hemispheres The nearly symmetrical left and right halves of the cerebral cortex. (p. 69)

cholecystokinin (CCK) (kola-sis-tow-KINE-in) Hormone secreted primarily by the small intestine that promotes satiation; also found in the brain. (p. 325)

chromosome A long, thread-like structure composed of twisted parallel strands of DNA; found in the cell nucleus. (p. 362)

chunking Increasing the amount of information that can be held in short-term memory by grouping related items together into a single unit, or *chunk*. (p. 236)

circadian rhythm (ser-KADE-ee-en) A cycle or rhythm that is roughly 24 hours long; the cyclical daily fluctuations in biological and psychological processes. (p. 137)

classical conditioning The basic learning process that involves repeatedly pairing a neutral stimulus with a response-producing stimulus until the neutral stimulus elicits the same response. (p. 186)

client-centered therapy A type of psychotherapy developed by humanistic psychologist Carl Rogers in which the therapist is nondirective and reflective, and the client directs the focus of each therapy session; also called *person-centered therapy*. (p. 613)

clustering Organizing items into related groups during recall from long-term memory. (p. 242)

cocaine A stimulant drug derived from the coca tree. (p. 174)

cochlea (COCK-lee-uh) The coiled, fluid-filled inner-ear structure that contains the basilar membrane and hair cells. (p. 103)

cognition The mental activities involved in acquiring, retaining, and using knowledge. (p. 277)

cognitive appraisal model of stress Developed by Richard Lazarus, a model of stress that emphasizes the role of an individual's evaluation *(appraisal)* of events and situations and of the resources that he or she has to deal with the event or situation. (p. 527)

cognitive appraisal theory of emotion The theory that emotional responses are triggered by a cognitive evaluation. (p. 352)

cognitive dissonance An unpleasant state of psychological tension or arousal *(dissonance)* that occurs when two thoughts or perceptions *(cognitions)* are inconsistent; typically results from the awareness that attitudes and behavior are in conflict. (p. 496)

cognitive map Tolman's term for the mental representation of the layout of a familiar environment. (p. 214)

cognitive therapies A group of psychotherapies based on the assumption that psychological problems are due to illogical patterns of thinking; treatment techniques focus on recognizing and altering these unhealthy thinking patterns. (p. 620)

cognitive therapy (CT) Therapy developed by Aaron T. Beck that focuses on changing the client's unrealistic and maladaptive beliefs. (p. 623)

cognitive-behavioral therapy (CBT) Therapy that integrates cognitive and behavioral techniques and that is based on the assumption that thoughts, moods, and behaviors are interrelated. (p. 624)

collective unconscious In Jung's theory, the hypothesized part of the unconscious mind that is inherited from previous generations and that contains universally shared ancestral experiences and ideas. (p. 455)

collectivistic cultures Cultures that emphasize the needs and goals of the group over the needs and goals of the individual. (p. 13)

color The perceptual experience of different wavelengths of light, involving hue, saturation (purity), and brightness (intensity). (p. 97)

color blindness One of several inherited forms of color deficiency or weakness in which an individual cannot distinguish between certain colors. (p. 99)

comparative psychology Branch of psychology that studies the behavior or different animal species. (p. 37)

competence motivation The desire to direct your behavior toward demonstrating competence and exercising control in a situation. (p. 336)

comprehension vocabulary The words that are understood by an infant or child. (p. 374)

compulsions Repetitive behaviors or mental acts that are performed to prevent or reduce anxiety. (p. 573)

concept A mental category of objects or ideas based on properties they share. (p. 278)

concrete operational stage In Piaget's theory, the third stage of cognitive development, which lasts from about age 7 to adolescence; characterized by the ability to think logically about concrete objects and situations. (p. 379)

conditional positive regard In Rogers's theory, the sense that you will be valued and loved only if you behave in a way that is acceptable to others; conditional love or acceptance. (p. 462)

conditioned reinforcer A stimulus or event that has acquired reinforcing value by being associated with a primary reinforcer; also called a *secondary reinforcer*. (p. 203)

conditioned response (CR) The learned, reflexive response to a conditioned stimulus. (p. 186)

conditioned stimulus (CS) A formerly neutral stimulus that acquires the capacity to elicit a reflexive response. (p. 186)

conditioning The process of learning associations between environmental events and behavioral responses. (p. 184)

cones The short, thick, pointed sensory receptors of the eye that detect color and are responsible for color vision and visual acuity. (p. 94)

conformity Adjusting your opinions, judgments, or behavior so that it matches the opinions, judgments, or behavior of other people, or the norms of a social group or situation. (p. 503)

consciousness Personal awareness of mental activities, internal sensations, and the external environment. (p. 134)

conservation In Piaget's theory, the understanding that two equal quantities remain equal even though the form or appearance is rearranged, as long as nothing is added or subtracted. (p. 379)

context effect The tendency to recover information more easily when the retrieval occurs in the same setting as the original learning of the information. (p. 245)

continuous reinforcement A schedule of reinforcement in which every occurrence of a particular response is followed by a reinforcer. (p. 210)

control group or control condition In an experiment, the group of participants who are exposed to all experimental conditions, except the independent variable; the group against which changes in the experimental group are compared. (p. 30)

coping Behavioral and cognitive responses used to deal with stressors; involves our efforts to change circumstances, or our interpretation of circumstances, to make them more favorable and less threatening. (p. 550)

cornea (CORE-nee-uh) A clear membrane covering the visible part of the eye that helps gather and direct incoming light. (p. 92)

corpus callosum A thick band of axons that connects the two cerebral hemispheres and acts as a communication link between them. (p. 69)

correlation The relationship between two variables. (p. A-9)

correlation coefficient A numerical indication of the magnitude and direction of the relationship (the *correlation*) between two variables. (pp. 25, A-9)

correlational study A research strategy that allows the precise calculation of how strongly related two factors are to each other. (p. 25)

cortical localization The notion that different functions are located or localized in different areas of the brain; also called *localization of function*. (pp. 64, 73)

corticosteroids (core-tick-oh-STAIR-oydz) Hormones released by the adrenal cortex that play a key role in the body's response to long-term stressors. (p. 536)

counterconditioning A behavior therapy technique based on classical conditioning that involves modifying behavior by conditioning a new response that is incompatible with a previously learned response. (p. 616)

creativity A group of cognitive processes used to generate useful, original, and novel ideas or solutions to problems. (p. 312)

critical thinking The active process of minimizing preconceptions and biases while evaluating evidence, determining the conclusions that can reasonably be drawn from evidence, and considering alternative explanations for research findings or other phenomena. (p. 18)

cross-cultural psychology Branch of psychology that studies the effects of culture on behavior and mental processes. (p. 13)

cued recall A test of long-term memory that involves remembering an item of information in response to a retrieval cue. (p. 244)

culture The attitudes, values, beliefs, and behaviors shared by a group of people and communicated from one generation to another. (p. 13)

cyclothymic disorder (si-klo-THY-mick) A mood disorder characterized by moderate but frequent mood swings that are not severe enough to qualify as bipolar disorder. (p. 579)

D

daily hassles Everyday minor events that annoy and upset people. (p. 531)

decay theory The view that forgetting is due to normal metabolic processes that occur in the brain over time. (p. 251)

decibel (DESS-uh-bell) The unit of measurement for loudness. (p. 101)

deindividuation The reduction of self-awareness and inhibitions that can occur when a person is a part of a group whose members feel anonymous. (p. 519)

déjà vu experience A memory illusion characterized by brief but intense feelings of familiarity in a situation that has never been experienced before. (p. 250)

delusion A falsely held belief that persists despite compelling contradictory evidence. (p. 593)

demand characteristics In a research study, subtle cues or signals expressed by the researcher that communicate the kind of response or behavior that is expected from the participant. (p. 29)

dementia Progressive deterioration and impairment of memory, reasoning, and other cognitive functions occurring as the result of a disease or a condition. (p. 268)

dendrites Multiple short fibers that extend from the neuron's cell body and receive information from other neurons or from sensory receptor cells. (p. 45)

deoxyribonucleic acid (DNA) The double-stranded molecule that encodes genetic instructions; the chemical basis of heredity. (p. 362)

dependent variable The factor that is observed and measured for change in an experiment; thought to be influenced by the independent variable; also called the *outcome variable*. (p. 27)

depressants A category of psychoactive drugs that depress or inhibit brain activity. (p. 167)

depth perception The use of visual cues to perceive the distance or three-dimensional characteristics of objects. (p. 118)

descriptive research methods Scientific procedures that involve systematically observing behavior in order to describe the relationship among behaviors and events. (p. 21)

descriptive statistics Mathematical methods used to organize and summarize data. (p. A-2)

developmental psychology The branch of psychology that studies how people change over the lifespan. (p. 360)

difference threshold The smallest possible difference between two stimuli that can be detected half the time; also called *just noticeable difference*. (p. 90)

diffusion of responsibility A phenomenon in which the presence of other people makes it less likely that any individual will help someone in distress because the obligation to intervene is shared among all the onlookers. (p. 516)

discrepancy hypothesis An approach to explaining job satisfaction that focuses on the discrepancy, if any, between what a person wants from a job and how that person evaluates what is actually experienced at work. (p. B-7)

discriminative stimulus A specific stimulus in the presence of which a particular response is more likely to be reinforced, and in the absence of which a particular response is not likely to be reinforced. (p. 207)

displacement The ego defense mechanism that involves unconsciously shifting the target of an emotional urge to a substitute target that is less threatening or dangerous. (p. 450)

display rules Social and cultural regulations governing emotional expression, especially facial expressions. (p. 347)

dissociation The splitting of consciousness into two or more simultaneous streams of mental activity. (p. 161)

dissociative amnesia A dissociative disorder involving the partial or total inability to recall important personal information. (p. 589)

dissociative anesthetics Class of drugs that reduce sensitivity to pain and produce feelings of detachment and dissociation; includes the club drugs phencyclidine (PCP) and ketamine. (p. 176)

dissociative disorders A category of psychological disorders in which extreme and frequent disruptions of awareness, memory, and personal identity impair the ability to function. (p. 589)

dissociative experience A break or disruption in consciousness during which awareness, memory, and personal identity become separated or divided. (p. 589)

dissociative fugue (fyoog) A dissociative disorder involving sudden and unexpected travel away from home, extensive amnesia, and identity confusion. (p. 590)

dissociative identity disorder (DID) A dissociative disorder involving extensive memory disruptions along with the presence of two or more distinct identities, or "personalities"; formerly called *multiple personality disorder.* (p. 590)

dopamine (DOPE-uh-meen) Neurotransmitter involved in the regulation of bodily movement, thought processes, and rewarding sensations. (p. 52)

dopamine hypothesis The view that schizophrenia is related to, and may be caused by, excessive activity of the neurotransmitter dopamine in the brain. (p. 600)

double-blind technique An experimental control in which neither the participants nor the researchers interacting with the participants are aware of the group or condition to which the participants have been assigned. (p. 28)

dream An unfolding sequence of thoughts, perceptions, and emotions that typically occurs during REM sleep and is experienced as a series of real-life events. (p. 148)

dream interpretation A technique used in psychoanalysis in which the content of dreams is analyzed for disguised or symbolic wishes, meanings, and motivations. (p. 611)

drive A need or internal motivational state that activates behavior to reduce the need and restore homeostasis. (p. 320)

drive theories The view that behavior is motivated by the desire to reduce internal tension caused by unmet biological needs. (p. 320)

drug abuse Recurrent drug use that results in disruptions in academic, social, or occupational functioning, or in legal or psychological problems. (p. 167)

drug rebound effect Withdrawal symptoms that are the opposite of a physically addictive drug's action. (p. 167)

drug tolerance A condition in which increasing amounts of a physically addictive drug are needed to produce the original, desired effect. (p. 166)

DSM-IV-TR Abbreviation for the *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition, Text Revision; the book published by the American Psychiatric Association that describes the specific symptoms and diagnostic guidelines for different psychological disorders. (p. 561)

dyspareunia A sexual dysfunction characterized by genital pain before, during, or after intercourse. (p. 432)

dyssomnias (dis-SOM-nee-uz) A category of sleep disorders involving disruptions in the amount, quality, or timing of sleep; includes insomnia, obstructive sleep apnea, and narcolepsy. (p. 154)

dysthymic disorder (dis-THY-mick) A mood disorder involving chronic, low-grade feelings of depression that produce subjective discomfort but do not seriously impair the ability to function. (p. 577)

E

eardrum A tightly stretched membrane at the end of the ear canal that vibrates when hit by sound waves. (p. 102)

eating disorder A category of mental disorders characterized by severe disturbances in eating behavior. (p. 582)

eclecticism (eh-KLEK-tuh-*sizz*-um) The pragmatic and integrated use of techniques from different psychotherapies. (p. 631)

EEG (electroencephalogram) The graphic record of brain activity produced by an electroencephalograph. (p. 140)

ego Latin for *I;* in Freud's theory, the partly conscious rational component of personality that regulates thoughts and behavior, and is most in touch with the demands of the external world. (p. 449)

ego defense mechanisms Largely unconscious distortions of thoughts or perceptions that act to reduce anxiety. (p. 450)

egocentrism In Piaget's theory, the inability to take another person's perspective or point of view. (p. 378)

elaborative rehearsal Rehearsal that involves focusing on the meaning of information to help encode and transfer it to long-term memory. (p. 238)

electroconvulsive therapy (ECT) A biomedical therapy used primarily in the treatment of depression that involves electrically inducing a brief brain seizure; also called *electroshock therapy.* (p. 642)

electroencephalograph (e-lec-tro-en-SEFF-uh-low-graph) An instrument that uses electrodes placed on the scalp to measure and record the brain's electrical activity. (p. 140)

embryonic period The second period of prenatal development, extending from the third week through the eighth week. (p. 365)

emotion A complex psychological state that involves a subjective experience, a physiological response, and a behavioral or expressive response. (p. 338)

emotional intelligence The capacity to understand and manage your own emotional experiences and to perceive, comprehend, and respond appropriately to the emotional responses of others. (p. 338)

emotion-focused coping Coping efforts primarily aimed at relieving or regulating the emotional impact of a stressful situation. (p. 551)

empirical evidence Verifiable evidence that is based upon objective observation, measurement, and/or experimentation. (p. 17)

encoding The process of transforming information into a form that can be entered into and retained by the memory system. (p. 232)

encoding failure The inability to recall specific information because of insufficient encoding of the information for storage in long-term memory. (p. 249)

encoding specificity principle The principle that when the conditions of information retrieval are similar to the conditions of information encoding, retrieval is more likely to be successful. (p. 245)

endocrine system (EN-doe-krin) System of glands, located throughout the body, that secrete hormones into the bloodstream. (p. 60)

endorphins (en-DORF-ins) Neurotransmitters that regulate pain perceptions. (p. 53)

energy homeostasis The long-term matching of food intake to energy expenditure. (p. 323)

epigenetics The study of the cellular mechanisms that control gene expression and of the ways that gene expression impacts health and behavior. (p. 364)

episodic memory Category of long-term memory that includes memories of particular events. (p. 240)

erectile dysfunction (ED) In males, sexual dysfunction characterized by a recurring inability to achieve or maintain an erect penis. (p. 432)

Eros The self-preservation or life instinct, reflected in the expression of basic biological urges that perpetuate the existence of the individual and the species. (p. 448)

ESP (extrasensory perception) Perception of information by some means other than through the normal processes of sensation. (p. 114)

ethnocentrism The belief that one's own culture or ethnic group is superior to all others and the related tendency to use one's own culture as a standard by which to judge other cultures. (pp. 13, 499)

evolutionary psychology The application of principles of evolution, including natural selection, to explain psychological processes and phenomena.) (p. 12)

exemplars Individual instances of a concept or category, held in memory. (p. 280)

experimental group or experimental condition In an experiment, the group of participants who are exposed to all experimental conditions, including the independent variable. (p. 28)

experimental method A method of investigation used to demonstrate cause-and-effect relationships by purposely manipulating one factor thought to produce change in another factor. (p. 27)

explicit cognition Deliberate, conscious mental processes involved in perceptions, judgments, decisions, and reasoning. (p. 488)

explicit memory Information or knowledge that can be consciously recollected; also called *declarative memory.* (p. 240)

exposure therapy Behavioral therapy for phobias, panic disorder, post-traumatic stress disorder, or related anxiety disorders in which the person is repeatedly exposed to the disturbing object or situation under controlled conditions. (p. 632)

extinction (in classical conditioning) The gradual weakening and apparent disappearance of conditioned behavior. In classical conditioning, extinction occurs when the conditioned stimulus is repeatedly presented without the unconditioned stimulus. (p. 189)

extinction (in operant conditioning) The gradual weakening and disappearance of conditioned behavior. In operant conditioning, extinction occurs when an emitted behavior is no longer followed by a reinforcer. (p. 210)

extraneous variable A factor or variable other than the ones being studied that, if not controlled, could affect the outcome of an experiment; also called a *confounding variable.* (p. 27)

extrinsic motivation External factors or influences on behavior, such as rewards, consequences, or social expectations. (p. 335)

eye movement desensitization reprocessing (EMDR) Therapy technique in which the client holds a vivid mental image of a troubling event or situation while rapidly moving his or her eyes back and forth in response to the therapist's waving finger or while the therapist administers some other form of bilateral stimulation. (p. 632)

F

facial feedback hypothesis The view that expressing a specific emotion, especially facially, causes the subjective experience of that emotion. (p. 351)

false memory A distorted or fabricated recollection of something that did not actually occur. (p. 255)

family therapy A form of psychotherapy that is based on the assumption that the family is a system and that treats the family as a unit. (p. 626)

female orgasmic disorder In females, sexual dysfunction characterized by consistent delays in achieving orgasm or the inability to achieve orgasm. (p. 432)

fetal period The third and longest period of prenatal development, extending from the ninth week until birth. (p. 367)

fight-or-flight response A rapidly occuring chain of internal physical reactions that prepare people either to fight or take flight from an immediate threat. (p. 535)

figure–ground relationship A Gestalt principle of perceptual organization that states that we automatically separate the elements of a perception into the feature that clearly stands out (the figure) and its less distinct background (the ground). (p. 116)

five-factor model of personality A trait theory of personality that identifies extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience as the fundamental building blocks of personality. (p. 469)

fixed-interval (FI) schedule A reinforcement schedule in which a reinforcer is delivered for the first response that occurs after a preset time interval has elapsed. (p. 211)

fixed-ratio (FR) schedule A reinforcement schedule in which a reinforcer is delivered after a fixed number of responses has occurred. (p. 211)

flashbulb memory The recall of very specific images or details surrounding a vivid, rare, or significant personal event; details may or may not be accurate. (p. 246)

forebrain The largest and most complex brain region, which contains centers for complex behaviors and mental processes; also called the *cerebrum.* (p. 68)

forgetting The inability to recall information that was previously available. (p. 247)

formal concept A mental category that is formed by learning the rules or features that define it. (p. 279)

formal operational stage In Piaget's theory, the fourth stage of cognitive development, which lasts from adolescence through adulthood; characterized by the ability to think logically about abstract principles and hypothetical situations. (p. 379)

fovea (FO-vee-uh) A small area in the center of the retina, composed entirely of cones, where visual information is most sharply focused. (p. 94)

free association A technique used in psychoanalysis in which the patient spontaneously reports all thoughts, feelings, and mental images as they come to mind, as a way of revealing unconscious thoughts and emotions. (pp. 446, 610)

frequency The rate of vibration, or the number of sound waves per second. (p. 101)

frequency distribution A summary of how often various scores occur in a sample of scores. Score values are arranged in order of magnitude, and the number of times each score occurs is recorded. (p. A-3)

frequency polygon A way of graphically representing a frequency distribution; frequency is marked above each score category on the graph's horizontal axis, and the marks are connected by straight lines. (p. A-3)

frequency theory The view that the basilar membrane vibrates at the same frequency as the sound wave. (p. 103)

frontal lobe The largest lobe of each cerebral hemisphere; processes voluntary muscle movements and is involved in thinking, planning, and emotional control. (p. 70)

functional fixedness The tendency to view objects as functioning only in their usual or customary way. (p. 284)

functional magnetic resonance imaging (fMRI) A noninvasive imaging technique that uses magnetic fields to map brain activity by measuring changes in the brain's blood flow and oxygen levels. (p. 34)

functional plasticity The brain's ability to shift functions from damaged to undamaged brain areas. (p. 64)

functionalism Early school of psychology that emphasized studying the purpose, or function, of behavior and mental experiences. (p. 5)

fundamental attribution error The tendency to attribute the behavior of others to internal, personal characteristics, while ignoring or underestimating the effects of external, situational factors; an attributional bias that is common in individualistic cultures. (p. 491)

G

***g* factor or general intelligence** The notion of a general intelligence factor that is responsible for a person's overall performance on tests of mental ability. (p. 299)

GABA (gamma-aminobutyric acid) Neurotransmitter that usually communicates an inhibitory message. (p. 53)

ganglion cells In the retina, the specialized neurons that connect to the bipolar cells; the bundled axons of the ganglion cells form the optic nerve. (p. 95)

gate-control theory of pain The theory that pain is a product of both physiological and psychological factors that cause spinal gates to open and relay patterns of intense stimulation to the brain, which perceives them as pain. (p. 110)

gender The cultural, social, and psychological meanings that are associated with masculinity or femininity. (p. 409)

gender roles The behaviors, attitudes, and personality traits that are designated as either masculine or feminine in a given culture. (p. 409)

gender-role stereotypes The beliefs and expectations people hold about the typical characteristics, preferences, and behavior of men and women. (p. 409)

gender schema theory The theory that gender-role development is influenced by the formation of schemas, or mental representations, of masculinity and femininity. (p. 418)

gene A unit of DNA on a chromosome that encodes instructions for making a particular protein molecule; the basic unit of heredity. (p. 362)

general adaptation syndrome Selye's term for the three-stage progression of physical changes that occur when an organism is exposed to intense and prolonged stress. The three stages are alarm, resistance, and exhaustion. (p. 537)

generalized anxiety disorder (GAD) An anxiety disorder characterized by excessive, global, and persistent symptoms of anxiety; also called *free-floating anxiety*. (p. 567)

genital herpes A sexually transmitted disease caused by the herpes simplex virus that can produce outbreaks of painful blisters in the genital and anal regions. (p. 434)

genotype (JEEN-oh-type) The genetic makeup of an individual organism. (p. 363)

germinal period The first two weeks of prenatal development. (p. 365)

Gestalt psychology (geh-SHTALT) A school of psychology founded in Germany in the early 1900s that maintained that our sensations are actively processed according to consistent perceptual rules that result in meaningful whole perceptions, or *gestalts*. (p. 115)

ghrelin (GRELL-in) Hormone manufactured primarily by the stomach that stimulates appetite and the secretion of growth hormone by the pituitary gland. (p. 324)

glial cells, or glia (GLEE-ull) Support cells that assist neurons by providing structural support, nutrition, and removal of cell wastes; manufacture myelin. (p. 46)

glucose Simple sugar that provides energy and is primarily produced by the conversion of carbohydrates and fats; commonly called *blood sugar*. (p. 323)

gonads The endocrine glands that secrete hormones that regulate sexual characteristics and reproductive processes; *ovaries* in females and *testes* in males. (p. 62)

graphology A pseudoscience that claims to assess personality, social, and occupational attributes based on a person's distinctive handwriting, doodles, and drawing style. (p. 475)

group therapy A form of psychotherapy that involves one or more therapists working simultaneously with a small group of clients. (p. 626)

gustation Technical name for the sense of taste. (p. 104)

H

hair cells The hair-like sensory receptors for sound, which are embedded in the basilar membrane of the cochlea. (p. 103)

hallucination A false or distorted perception that seems vividly real to the person experiencing it. (p. 593)

health psychology The branch of psychology that studies how biological, behavioral, and social factors influence health, illness, medical treatment, and health-related behaviors. (p. 528)

heritability The percentage of variation within a given population that is due to heredity. (p. 306)

heuristic A problem-solving strategy that involves following a general rule of thumb to reduce the number of possible solutions. (p. 282)

hidden observer Hilgard's term for the hidden, or dissociated, stream of mental activity that continues during hypnosis. (p. 161)

hierarchy of needs Maslow's hierarchical division of motivation into levels that progress from basic physical needs to psychological needs to self- fulfillment needs. (p. 333)

higher order conditioning (also called second-order conditioning) A procedure in which a conditioned stimulus from one learning trial functions as the unconditioned stimulus in a new conditioning trial; the second conditioned stimulus comes to elicit the conditioned response, even though it has never been directly paired with the unconditioned stimulus. (p. 188)

hindbrain A region at the base of the brain that contains several structures that regulate basic life functions. (p. 67)

hindsight bias The tendency to overestimate one's ability to have foreseen or predicted the outcome of an event. (p. 491)

hippocampus A curved forebrain structure that is part of the limbic system and is involved in learning and forming new memories. (p. 71)

histogram A way of graphically representing a frequency distribution; a type of bar chart that uses vertical bars that touch. (p. A-3)

homeostasis (home-ee-oh-STAY-sis) The idea that the body monitors and maintains internal states, such as body temperature and energy supplies, at relatively constant levels; in general, the tendency to reach or maintain equilibrium. (p. 320)

hormones Chemical messengers secreted into the bloodstream primarily by endocrine glands. (p. 60)

hue The property of wavelengths of light known as color; different wavelengths correspond to our subjective experience of different colors. (p. 97)

human immunodeficiency virus (HIV) A retrovirus that infects, destroys, and reduces the number of helper T cells in the immune system, producing AIDS. (p. 434)

humanistic psychology The theoretical viewpoint on personality that generally emphasizes the inherent goodness of people, human potential, self-actualization, the self-concept, and healthy personality development. (pp. 9, 459)

humanistic theories of motivation The view that emphasizes the importance of psychological and cognitive factors in motivation, especially the notion that people are motivated to realize their personal potential. (p. 322)

hypermnesia (high-perm-NEE-zha) The supposed enhancement of a person's memory for past events through a hypnotic suggestion. (p. 160)

hypnagogic hallucinations (hip-na-GAH-jick) Vivid sensory phenomena that occur during the onset of sleep. (p. 142)

hypnosis (hip-NO-sis) A cooperative social interaction in which the hypnotized person responds to the hypnotist's suggestions with changes in perception, memory, and behavior. (p. 159)

hypoactive sexual desire disorder A sexual dysfunction characterized by little or no sexual desire. (p. 432)

hypocretins A special class of neurotransmitters produced during the daytime to maintain a steady state of wakefulness; also called *orexins.* (p. 156)

hypothalamus (hi-poe-THAL-uh-muss) A peanut-sized forebrain structure that is part of the limbic system and regulates behaviors related to survival, such as eating, drinking, and sexual activity. (p. 72)

hypothesis (high-POTH-eh-sis) A tentative statement about the relationship between two or more variables; a testable prediction or question. (p. 17)

I

id Latin for *the it;* in Freud's theory, the completely unconscious, irrational component of personality that seeks immediate satisfaction of instinctual urges and drives; ruled by the pleasure principle. (p. 448)

identification In psychoanalytic theory, an ego defense mechanism that involves reducing anxiety by imitating the behavior and characteristics of another person. (p. 452)

identity A person's sense of self, including his or her memories, experiences, and the values and beliefs that guide his or her behavior. (p. 387)

imagination inflation A memory phenomenon in which vividly imagining an event markedly increases confidence that the event actually occurred. (p. 258)

immune system Body system that produces specialized white blood cells that protect the body from viruses, bacteria, and tumor cells. (p. 539)

implicit attitudes Preferences and biases toward particular groups that are automatic, spontaneous, unintentional, and often unconscious; measured with the *Implicit Associations Test* (IAT). (p. 500)

implicit cognition Automatic, nonconscious mental processes that influence perceptions, judgments, decisions, and reasoning. (p. 488)

implicit memory Information or knowledge that affects behavior or task performance but cannot be consciously recollected; also called *non-declarative memory.* (p. 240)

implicit personality theory A network of assumptions or beliefs about the relationships among various types of people, traits, and behaviors. (p. 488)

incentive theories The view that behavior is motivated by the pull of external goals, such as rewards. (p. 320)

independent variable The purposely manipulated factor thought to produce change in an experiment; also called the *treatment variable.* (p. 27)

individualistic cultures Cultures that emphasize the needs and goals of the individual over the needs and goals of the group. (p. 13)

induction A discipline technique that combines parental control with explaining why a behavior is prohibited. (p. 402)

industrial/organizational (I/O) psychology The branch of psychology that focuses on the study of human behavior in the workplace. (p. B-2)

inferential statistics Mathematical methods used to determine how likely it is that a study's outcome is due to chance and whether the outcome can be legitimately generalized to a larger population. (p. A-11)

informational social influence Behavior that is motivated by the desire to be correct. (p. 504)

information-processing model of cognitive development The model that views cognitive development as a process that is continuous over the lifespan and that studies the development of basic mental processes such as attention, memory, and problem solving. (p. 382)

in-group A social group to which one belongs. (p. 499)

in-group bias The tendency to judge the behavior of in-group members favorably and out-group members unfavorably. (p. 499)

inhalants Chemical substances that are inhaled to produce an alteration in consciousness. (p. 170)

inner ear The part of the ear where sound is transduced into neural impulses; consists of the cochlea and semicircular canals. (p. 103)

insight The sudden realization of how a problem can be solved. (p. 283)

insomnia A condition in which a person regularly experiences an inability to fall asleep, to stay asleep, or to feel adequately rested by sleep. (p. 155)

instinct theories The view that certain human behaviors are innate and due to evolutionary programming. (p. 319)

instinctive drift The tendency of an animal to revert to instinctive behaviors that can interfere with the performance of an operantly conditioned response. (p. 218)

insulin Hormone produced by the pancreas that regulates blood levels of glucose and signals the hypothalamus, regulating hunger and eating behavior. (p. 323)

intelligence The global capacity to think rationally, act purposefully, and deal effectively with the environment. (p. 294)

intelligence quotient (IQ) A measure of general intelligence derived by comparing an individual's score with the scores of others in the same age group. (p. 295)

interference theory The theory that forgetting is caused by one memory competing with or replacing another. (p. 251)

interneuron Type of neuron that communicates information from one neuron to the next. (p. 45)

interpersonal engagement Emotion dimension reflecting the degree to which emotions involve a relationship with another person or other people. (p. 340)

interpersonal therapy (IPT) A brief, psychodynamic psychotherapy that focuses on current relationships and is based on the assumption that symptoms are caused and maintained by interpersonal problems. (p. 612)

interpretation A technique used in psychoanalysis in which the psychoanalyst offers a carefully timed explanation of the patient's dreams, free associations, or behaviors to facilitate the recognition of unconscious conflicts or motivations. (p. 611)

intersexed Condition in which a person's biological sex is ambiguous, often combining aspects of both male and female anatomy and/or physiology. (p. 417)

intrinsic motivation The desire to engage in tasks that are inherently satisfying and enjoyable, novel, or optimally challenging; the desire to do something for its own sake. (p. 335)

intuition Coming to a conclusion or making a judgment without conscious awareness of the thought processes involved. (p. 283)

iris (EYE-riss) The colored part of the eye, which is the muscle that controls the size of the pupil. (p. 92)

irreversibility In Piaget's theory, the inability to mentally reverse a sequence of events or logical operations. (p. 378)

J

James–Lange theory of emotion The theory that emotions arise from the perception of body changes. (p. 349)

job analysis A technique that identifies the major responsibilities of a job, along with the human characteristics needed to fill it. (p. B-4)

just-world hypothesis The assumption that the world is fair and that therefore people get what they deserve and deserve what they get. (p. 491)

K

K complex Single but large high-voltage spike of brain activity that characterizes stage 2 NREM sleep. (p. 143)

kinesthetic sense (kin-ess-THET-ick) The technical name for the sense of location and position of body parts in relation to one another. (p. 110)

L

language A system for combining arbitrary symbols to produce an infinite number of meaningful statements. (p. 289)

latent content In Freud's psychoanalytic theory, the unconscious wishes, thoughts, and urges that are concealed in the manifest content of a dream. (p. 151)

latent learning Tolman's term for learning that occurs in the absence of reinforcement but is not behaviorally demonstrated until a reinforcer becomes available. (p. 214)

lateralization of function The notion that specific psychological or cognitive functions are processed primarily on one side of the brain. (p. 75)

law of effect Learning principle, proposed by Thorndike, that responses followed by a satisfying effect become strengthened and are more likely to recur in a particular situation, while responses followed by a dissatisfying effect are weakened and less likely to recur in a particular situation. (p. 200)

leader–member exchange model A model of leadership emphasizing that the quality of the interactions between supervisors and subordinates varies depending on the unique characteristics of both. (p. B-9)

learned helplessness A phenomenon in which exposure to inescapable and uncontrollable aversive events produces passive behavior. (p. 216)

learning A process that produces a relatively enduring change in behavior or knowledge as a result of past experience. (p. 184)

lens A transparent structure, located behind the pupil, that actively focuses, or bends, light as it enters the eye. (p. 94)

leptin Hormone produced by fat cells that signals the hypothalamus, regulating hunger and eating behavior. (p. 326)

leptin resistance A condition in which higher-than-normal blood levels of the hormone leptin do not produce the expected physiological response. (p. 331)

libido The psychological and emotional energy associated with expressions of sexuality; the sex drive. (p. 448)

limbic system A group of forebrain structures that form a border around the brainstem and are involved in emotion, motivation, learning, and memory. (p. 71)

linguistic relativity hypothesis The hypothesis that differences among languages cause differences in the thoughts of their speakers. (p. 290)

lithium A naturally occurring substance that is used in the treatment of bipolar disorder. (p. 639)

long-term memory The stage of memory that represents the long-term storage of information. (p. 233)

long-term potentiation A long-lasting increase in synaptic strength between two neurons. (p. 263)

loudness The intensity (or amplitude) of a sound wave, measured in decibels. (p. 101)

LSD A synthetic psychedelic drug. (p. 175)

lymphocytes (LIMF-oh-sites) Specialized white blood cells that are responsible for immune defenses. (p. 539)

M

magnetic resonance imaging (MRI) A noninvasive imaging technique that produces highly detailed images of the body's structures and tissues, using electromagnetic signals generated by the body in response to magnetic fields. (p. 34)

main effect Any change that can be directly attributed to the independent or treatment variable after controlling for other possible influences. (p. 29)

maintenance rehearsal The mental or verbal repetition of information in order to maintain it beyond the usual 20-second duration of short-term memory. (p. 235)

major depression A mood disorder characterized by extreme and persistent feelings of despondency, worthlessness, and hopelessness, causing impaired emotional, cognitive, behavioral, and physical functioning. (p. 576)

male orgasmic disorder In males, sexual dysfunction characterized by delayed orgasm during intercourse or the inability to achieve orgasm during intercourse. (p. 432)

manic episode A sudden, rapidly escalating emotional state characterized by extreme euphoria, excitement, physical energy, and rapid thoughts and speech. (p. 578)

manifest content In Freud's psychoanalytic theory, the elements of a dream that are consciously experienced and remembered by the dreamer. (p. 151)

marijuana A psychoactive drug derived from the hemp plant. (p. 175)

MDMA or ecstasy Synthetic club drug that combines stimulant and mild psychedelic effects. (p. 176)

mean The sum of a set of scores in a distribution divided by the number of scores; the mean is usually the most representative measure of central tendency. (p. A-5)

measure of central tendency A single number that presents some information about the "center" of a frequency distribution. (p. A-5)

measure of variability A single number that presents information about the spread of scores in a distribution. (p. A-6)

median The score that divides a frequency distribution exactly in half so that the same number of scores lie on each side of it. (p. A-5)

meditation Any one of a number of sustained concentration techniques that focus attention and heighten awareness. (p. 163)

medulla (meh-DOOL-uh) A hindbrain structure that controls vital life functions such as breathing and circulation. (p. 67)

melatonin (mel-ah-TONE-in) A hormone manufactured by the pineal gland that produces sleepiness. (p. 138)

memory The mental processes that enable you to retain and retrieve information over time. (p. 232)

memory consolidation The gradual, physical process of converting new long-term memories to stable, enduring memory codes. (p. 265)

memory trace or engram The hypothetical brain changes associated with a particular stored memory. (p. 261)

menarche (meh-NAR-kee) A female's first menstrual period, which occurs during puberty. (p. 383)

menopause The natural cessation of menstruation and the end of reproductive capacity in women. (p. 392)

mental age A measurement of intelligence in which an individual's mental level is expressed in terms of the average abilities of a given age group. (p. 294)

mental image A mental representation of objects or events that are not physically present. (p. 277)

mental retardation Disorder characterized by intellectual function that is significantly below average, usually defined as a measured IQ of 70 or below, and that is caused by brain injury, disease, or a genetic disorder. (p. 302)

mental set The tendency to persist in solving problems with solutions that have worked in the past. (p. 284)

mere exposure effect The finding that repeated exposure to a stimulus increases a person's preference for that stimulus. (p. 90)

mescaline (MESS-kuh-*lin*) A psychedelic drug derived from the peyote cactus. (p. 174)

meta-analysis A statistical technique that involves combining and analyzing the results of many research studies on a specific topic in order to identify overall trends. (p. 20)

midbrain The middle and smallest brain region, involved in processing auditory and visual sensory information. (p. 68)

middle ear The part of the ear that amplifies sound waves; consists of three small bones: the hammer, the anvil, and the stirrup. (p. 102)

mindfulness meditation A technique in which practitioners focus *awareness* on *present experience* with *acceptance*. (p. 555)

Minnesota Multiphasic Personality Inventory (MMPI) A self-report inventory that assesses personality characteristics and psychological disorders; used to assess both normal and disturbed populations. (p. 476)

mirror neurons A type of neuron that activates both when an action is performed and when the same action is perceived. (p. 220)

misinformation effect A memory-distortion phenomenon in which a person's existing memories can be altered if the person is exposed to misleading information. (p. 254)

mode The most frequently occurring score in a distribution. (p. A-5)

monocular cues (moe-NOCK-you-ler) Distance or depth cues that can be processed by either eye alone. (p. 118)

mood congruence An encoding specificity phenomenon in which a given mood tends to evoke memories that are consistent with that mood. (p. 246)

mood disorders A category of mental disorders in which significant and persistent disruptions in mood or emotions cause impaired cognitive, behavioral, and physical functioning; also called *affective disorders*. (p. 575)

moon illusion A visual illusion involving the misperception that the moon is larger when it is on the horizon than when it is directly overhead. (p. 123)

moral reasoning The aspect of cognitive development that has to do with how an individual reasons about moral decisions. (p. 389)

motivation The biological, emotional, cognitive, or social forces that activate and direct behavior. (p. 318)

motor neuron Type of neuron that signals muscles to relax or contract. (p. 45)

Müller-Lyer illusion A famous visual illusion involving the misperception of the identical length of two lines, one with arrows pointed inward, one with arrows pointed outward. (p. 123)

myelin sheath (MY-eh-lin) A white, fatty covering wrapped around the axons of some neurons that increases their communication speed. (p. 47)

N

narcolepsy (NAR-ko-lep-see) A sleep disorder characterized by excessive daytime sleepiness and brief lapses into sleep throughout the day. (p. 156)

natural concept A mental category that is formed as a result of everyday experience. (p. 280)

natural experiment A study investigating the effects of a naturally occurring event on the research participants. (p. 32)

naturalistic observation The systematic observation and recording of behaviors as they occur in their natural setting. (p. 21)

negative correlation A finding that two factors vary systematically in opposite directions, one increasing in size as the other decreases. (p. A-9)

negative correlation A finding that two factors vary systematically in opposite directions, one increasing as the other decreases. (p. 26)

negative reinforcement A situation in which a response results in the removal of, avoidance of, or escape from a punishing stimulus, increasing the likelihood that the response will be repeated in similar situations. (p. 202)

negative symptoms In schizophrenia, symptoms that reflect defects or deficits in normal functioning, including flat affect, alogia, and avolition. (p. 592)

neodissociation theory of hypnosis Theory proposed by Ernest Hilgard that explains hypnotic effects as being due to the splitting of consciousness into two simultaneous streams of mental activity, only one of which the hypnotic participant is consciously aware of during hypnosis. (p. 161)

nerves Bundles of neuron axons that carry information in the peripheral nervous system. (p. 56)

nervous system The primary internal communication network of the body; divided into the central nervous system and the peripheral nervous system. (p. 56)

neurocognitive model of dreaming Model of dreaming that emphasizes the continuity of waking and dreaming cognition, and states that dreaming is like thinking under conditions of reduced sensory input and the absence of voluntary control. (p. 153)

neurogenesis The development of new neurons. (p. 64)

neuron Highly specialized cell that communicates information in electrical and chemical form; a nerve cell. (p. 45)

neuropeptide Y (NPY) Neurotransmitter found in several brain areas, most notably the hypothalamus, that stimulates eating behavior and reduces metabolism, promoting positive energy balance and weight gain. (p. 326)

neuroscience The study of the nervous system, especially the brain. (pp. 10, 44)

neurotransmitters Chemical messengers manufactured by a neuron. (p. 50)

nicotine A stimulant drug found in tobacco products. (p. 173)

nightmare A vivid and frightening or unpleasant anxiety dream that occurs during REM sleep. (p. 151)

nociceptors Specialized sensory receptors for pain that are found in the skin, muscles, and internal organs. (p. 108)

norepinephrine (nor-ep-in-EF-rin) Neurotransmitter involved in learning, memory, and regulation of sleep; also a hormone manufactured by adrenal glands. (p. 52)

normal curve or normal distribution A bell-shaped distribution of individual differences in a normal population in which most scores cluster around the average score. (p. 297)

normative social influence Behavior that is motivated by the desire to gain social acceptance and approval. (p. 504)

NREM sleep Quiet, typically dreamless sleep in which rapid eye movements are absent; divided into four stages; also called *quiet sleep*. (p. 140)

O

obedience The performance of a behavior in response to a direct command. (p. 505)

obese Condition characterized by excessive body fat and a body mass index equal to or greater than 30.0. (p. 328)

object permanence The understanding that an object continues to exist even when it can no longer be seen. (p. 377)

observational learning Learning that occurs through observing the actions of others. (p. 218)

obsessions Repeated, intrusive, and uncontrollable irrational thoughts or mental images that cause extreme anxiety and distress. (p. 573)

obsessive–compulsive disorder (OCD) An anxiety disorder in which the symptoms of anxiety are triggered by intrusive, repetitive thoughts and urges to perform certain actions. (p. 572)

obstructive sleep apnea (APP-nee-uh) A sleep disorder in which the person repeatedly stops breathing during sleep. (p. 155)

occipital lobe (ock-SIP-it-ull) An area at the back of each cerebral hemisphere that is the primary receiving area for visual information. (p. 69)

Oedipus complex In Freud's theory, a child's unconscious sexual desire for the opposite-sex parent, usually accompanied by hostile feelings toward the same-sex parent. (p. 452)

olfaction Technical name for the sense of smell. (p. 104)

olfactory bulb (ole-FACK-toe-ree) The enlarged ending of the olfactory cortex at the front of the brain where the sensation of smell is registered. (p. 105)

operant Skinner's term for an actively emitted (or voluntary) behavior that operates on the environment to produce consequences. (p. 201)

operant chamber or Skinner box The experimental apparatus invented by B. F. Skinner to study the relationship between environmental events and active behaviors. (p. 209)

operant conditioning The basic learning process that involves changing the probability that a response will be repeated by manipulating the consequences of that response. (p. 201)

operational definition A precise description of how the variables in a study will be manipulated or measured. (p. 18)

opiates (OH-pee-ets) A category of psychoactive drugs that are chemically similar to morphine and have strong pain-relieving properties. (p. 171)

opponent-process theory of color vision The theory that color vision is the product of opposing pairs of color receptors, red–green, blue–yellow, and black–white; when one member of a color pair is stimulated, the other member is inhibited. (p. 99)

optic chiasm (KI-az-em) Point in the brain where the optic nerve fibers from each eye meet and partly cross over to the opposite side of the brain. (p. 96)

optic disk Area of the retina without rods or cones, where the optic nerve exits the back of the eye. (p. 94)

optic nerve The thick nerve that exits from the back of the eye and carries visual information to the visual cortex in the brain. (p. 96)

optimistic explanatory style Accounting for negative events or situations with external, unstable, and specific explanations. (p. 543)

organizational behavior A subarea of I/O psychology that focuses on the workplace culture and its influence on employee behavior. (p. B-2)

outer ear The part of the ear that collects sound waves; consists of the pinna, the ear canal, and the eardrum. (p. 102)

out-group A social group to which one does not belong. (p. 499)

out-group homogeneity effect The tendency to see members of out-groups as very similar to one another. (p. 499)

P

pain The unpleasant sensation of physical discomfort or suffering that can occur in varying degrees of intensity. (p. 108)

panic attack A sudden episode of extreme anxiety that rapidly escalates in intensity. (p. 568)

panic disorder An anxiety disorder in which the person experiences frequent and unexpected panic attacks. (p. 568)

paranoid personality disorder A personality disorder characterized by a pervasive distrust and suspiciousness of the motives of others without sufficient basis. (p. 586)

paraphilia (pair-uh-FILL-ee-uh) Any of several forms of nontraditional sexual behavior in which a person's sexual gratification depends on an unusual sexual experience, object, or fantasy. (p. 433)

parapsychology The scientific investigation of claims of paranormal phenomena and abilities. (p. 114)

parasomnias (pare-uh-SOM-nee-uz) A category of sleep disorders characterized by arousal or activation during sleep or sleep transitions; includes *sleepwalking, sleep terrors, sleepsex, sleep-related eating disorder,* and *REM sleep behavior disorder.* (p. 154)

parasympathetic nervous system Branch of the autonomic nervous system that maintains normal bodily functions and conserves the body's physical resources. (p. 60)

parietal lobe (puh-RYE-et-ull) An area on each hemisphere of the cerebral cortex located above the temporal lobe that processes somatic sensations. (p. 69)

partial reinforcement A situation in which the occurrence of a particular response is only sometimes followed by a reinforcer. (p. 210)

partial reinforcement effect The phenomenon in which behaviors that are conditioned using partial reinforcement are more resistant to extinction than behaviors that are conditioned using continuous reinforcement. (p. 210)

perception The process of integrating, organizing, and interpreting sensations. (p. 88)

perceptual constancy The tendency to perceive objects, especially familiar objects, as constant and unchanging despite changes in sensory input. (p. 122)

perceptual illusion The misperception of the true characteristics of an object or an image. (p. 123)

perceptual set The tendency to perceive objects or situations from a particular frame of reference. (p. 126)

peripheral nervous system (per-IF-er-ull) Division of the nervous system that includes all the nerves lying outside the central nervous system. (p. 58)

permissive parenting style Parenting style in which parents are extremely tolerant and not demanding; permissive-indulgent parents are responsive to their children, while permissive-indifferent parents are less. (p. 402)

person perception The mental processes we use to form judgments and draw conclusions about the characteristics and motives of other people. (p. 487)

personality An individual's unique and relatively consistent patterns of thinking, feeling, and behaving. (p. 445)

personality disorder Inflexible, maladaptive patterns of thoughts, emotions, behavior, and interpersonal functioning that are stable over time and across situations, and that deviate from the expectations of the individual's culture. (p. 585)

personality theory A theory that attempts to describe and explain similarities and differences in people's patterns of thinking, feeling, and behaving. (p. 445)

personnel psychology A subarea of I/O psychology that focuses on matching people's characteristics to job requirements, accurately measuring job performance, and assessing employee training needs. (p. B-2)

persuasion The deliberate attempt to influence the attitudes or behavior of another person in a situation in which that person has some freedom of choice. (p. 520)

pessimistic explanatory style Accounting for negative events or situations with internal, stable, and global explanations. (p. 543)

phenotype (FEEN-oh-type) The observable traits or characteristics of an organism as determined by the interaction of genetics and environmental factors. (p. 363)

pheromones Chemical signals released by an animal that communicate information and affect the behavior of other animals of the same species. (p. 106)

phobia A persistent and irrational fear of a specific object, situation, or activity. (p. 569)

phrenology (freh-NOL-uh-gee) A pseudoscientific theory of the brain that claimed that personality characteristics, moral character, and intelligence could be determined by examining the bumps on a person's skull. (p. 64)

physical dependence A condition in which a person has physically adapted to a drug so that he or she must take the drug regularly in order to avoid withdrawal symptoms. (p. 166)

pitch The relative highness or lowness of a sound, determined by the frequency of a sound wave. (p. 101)

pituitary gland (pih-TOO-ih-tare-ee) Endocrine gland attached to the base of the brain that secretes hormones that affect the function of other glands as well as hormones that act directly on physical processes. (p. 60)

place theory The view that different frequencies cause larger vibrations at different locations along the basilar membrane. (p. 104)

placebo A fake substance, treatment, or procedure that has no known direct effects. (p. 28)

placebo effect Any change attributed to a person's beliefs and expectations rather than an actual drug, treatment, or procedure; also called *expectancy effect.* (p. 28)

placebo response An individual's psychological and physiological response to what is actually a fake treatment or drug; also called *placebo effect.* (p. 194)

pleasure principle The motive to obtain pleasure and avoid tension or discomfort; the most fundamental human motive and the guiding principle of the id. (p. 448)

pons A hindbrain structure that connects the medulla to the two sides of the cerebellum; helps coordinate and integrate movements on each side of the body. (p. 68)

population A complete set of something—people, nonhuman animals, objects, or events. (p. A-13)

positive correlation A finding that two factors vary systematically in the same direction, increasing or decreasing together. (pp. 26, A-9)

positive incentive value In eating behavior, the anticipated pleasure of consuming a particular food; in general, the expectation of pleasure or satisfaction in performing a particular behavior. (p. 325)

positive psychology The study of positive emotions and psychological states, positive individual traits, and the social institutions that foster positive individuals and communities. (p. 11)

positive reinforcement A situation in which a response is followed by the addition of a reinforcing stimulus, increasing the likelihood that the response will be repeated in similar situations. (p. 202)

positive symptoms In schizophrenia, symptoms that reflect excesses or distortions of normal functioning, including delusions, hallucinations, and disorganized thoughts and behavior. (p. 592)

positron emission tomography (PET scan) An invasive imaging technique that provides color-coded images of brain activity by tracking the brain's use of a radioactively tagged compound, such as glucose, oxygen, or a drug. (p. 34)

possible selves The aspect of the self-concept that includes images of the selves that you hope, fear, or expect to become in the future. (p. 479)

posthypnotic amnesia The inability to recall specific information because of a hypnotic suggestion. (p. 160)

posthypnotic suggestion A suggestion made during hypnosis that the person should carry out a specific instruction following the hypnotic session. (p. 160)

post-traumatic stress disorder (PTSD) An anxiety disorder in which chronic and persistent symptoms of anxiety develop in response to an extreme physical or psychological trauma. (p. 571)

practice effect Any change in performance that results from mere repetition of a task. (p. 29)

prejudice A negative attitude toward people who belong to a specific social group. (p. 497)

premature ejaculation In males, sexual dysfunction characterized by orgasm occurring before it is desired, often immediately or shortly after sexual stimulation or penetration. (p. 432)

prenatal stage The stage of development before birth; divided into the germinal, embryonic, and fetal periods. (p. 365)

preoperational stage In Piaget's theory, the second stage of cognitive development, which lasts from about age 2 to age 7; characterized by increasing use of symbols and prelogical thought processes. (p. 377)

primary reinforcer A stimulus or event that is naturally or inherently reinforcing for a given species, such as food, water, or other biological necessities. (p. 203)

primary sex characteristics Sexual organs that are directly involved in reproduction, such as the uterus, ovaries, penis, and testicles. (p. 383)

proactive interference Forgetting in which an old memory interferes with remembering a new memory; forward-acting memory interference. (p. 251)

problem solving Thinking and behavior directed toward attaining a goal that is not readily available. (p. 281)

problem-focused coping Coping efforts primarily aimed at directly changing or managing a threatening or harmful stressor. (p. 550)

procedural memory Category of long-term memory that includes memories of different skills, operations, and actions. (p. 239)

production vocabulary The words that an infant or child understands and can speak. (p. 374)

projective test A type of personality test that involves a person's interpreting an ambiguous image; used to assess unconscious motives, conflicts, psychological defenses, and personality traits. (p. 474)

proprioceptors (pro-pree-oh-SEP-ters) Sensory receptors, located in the muscles and joints, that provide information about body position and movement. (p. 110)

prosocial behavior Any behavior that helps another, whether the underlying motive is self-serving or selfless. (p. 515)

prospective memory Remembering to do something in the future. (p. 250)

prototype The most typical instance of a particular concept. (p. 280)

pseudoscience Fake or false science that makes claims based on little or no scientific evidence. (p. 22)

psychedelic drugs (sy-kuh-DEL-ick) A category of psychoactive drugs that create sensory and perceptual distortions, alter mood, and affect thinking. (p. 174)

psychiatry Medical specialty area focused on the diagnosis, treatment, causes, and prevention of mental and behavioral disorders. (p. 16)

psychoactive drug A drug that alters consciousness, perception, mood, and behavior. (p. 166)

psychoanalysis A type of psychotherapy originated by Sigmund Freud in which free association, dream interpretation, and analysis of resistance and transference are used to explore repressed or unconscious impulses, anxieties, and internal conflicts. (pp. 7, 445, 610)

psychological disorder or mental disorder A pattern of behavioral and psychological symptoms that causes significant personal distress, impairs the ability to function in one or more important areas of life, or both. (p. 561)

psychological test A test that assesses a person's abilities, aptitudes, interests, or personality on the basis of a systematically obtained sample of behavior. (p. 474)

psychology The scientific study of behavior and mental processes. (p. 3)

psychoneuroimmunology An interdisciplinary field that studies the interconnections among psychological processes, nervous and endocrine system functions, and the immune system. (p. 539)

psychopathology The scientific study of the origins, symptoms, and development of psychological disorders. (p. 561)

psychosexual stages In Freud's theory, age-related developmental periods in which the child's sexual urges are focused on different areas of the body and are expressed through the activities associated with those areas. (p. 452)

psychotherapy The treatment of emotional, behavioral, and interpersonal problems through the use of psychological techniques designed to encourage understanding of problems and modify troubling feelings, behaviors, or relationships. (p. 608)

psychotropic medications (*sy*-ko-TRO-pick) Drugs that alter mental functions, alleviate psychological symptoms, and are used to treat psychological or mental disorders. (p. 636)

puberty The stage of adolescence in which an individual reaches sexual maturity and becomes physiologically capable of sexual reproduction. (p. 383)

punishment The presentation of a stimulus or event following a behavior that acts to decrease the likelihood of the behavior's being repeated. (p. 204)

punishment by application A situation in which an operant is followed by the presentation or addition of an aversive stimulus; also called *positive punishment.* (p. 204)

punishment by removal A situation in which an operant is followed by the removal or subtraction of a reinforcing stimulus; also called *negative punishment.* (p. 205)

pupil The opening in the middle of the iris that changes size to let in different amounts of light. (p. 92)

R

random assignment The process of assigning participants to experimental conditions so that all participants have an equal chance of being assigned to any of the conditions or groups in the study. (p. 28)

random selection Process in which subjects are selected randomly from a larger group such that every group member has an equal chance of being included in the study. (p. 24)

range A measure of variability; the highest score in a distribution minus the lowest score. (p. A-6)

rational-emotive therapy (RET) A type of cognitive therapy, developed by psychologist Albert Ellis, that focuses on changing the client's irrational beliefs. (p. 621)

reality principle The capacity to accommodate external demands by postponing gratification until the appropriate time or circumstances exist. (p. 449)

recall A test of long-term memory that involves retrieving information without the aid of retrieval cues; also called *free recall.* (p. 244)

reciprocal determinism A model proposed by psychologist Albert Bandura that explains human functioning and personality as caused by the interaction of behavioral, cognitive, and environmental factors. (p. 464)

recognition A test of long-term memory that involves identifying correct information out of several possible choices. (p. 245)

reinforcement The occurrence of a stimulus or event following a response that increases the likelihood of that response being repeated. (p. 201)

reliability The ability of a test to produce consistent results when administered on repeated occasions under similar conditions. (p. 298)

REM rebound A phenomenon in which a person who is deprived of REM sleep greatly increases the amount of time spent in REM sleep at the first opportunity to sleep uninterrupted. (p. 147)

REM sleep Type of sleep during which rapid eye movements (REM) and dreaming usually occur and voluntary muscle activity is suppressed; also called *active sleep* or *paradoxical sleep.* (p. 140)

REM sleep behavior disorder (RBD) A sleep disorder characterized by the brain's failure to suppress voluntary actions during REM sleep, resulting in the sleeper verbally and physically responding to the dream story. (p. 158)

replicate To repeat or duplicate a scientific study in order to increase confidence in the validity of the original findings. (p. 20)

representative sample A selected segment that very closely parallels the larger population being studied on relevant characteristics. (p. 24)

representativeness heuristic A strategy in which the likelihood of an event is estimated by comparing how similar it is to the prototype of the event. (p. 287)

repression Motivated forgetting that occurs unconsciously; a memory that is blocked and unavailable to consciousness. (pp. 252, 450)

resistance In psychoanalysis, the patient's unconscious attempts to block the revelation of repressed memories and conflicts. (p. 610)

resting potential State in which a neuron is prepared to activate and communicate its message if it receives sufficient stimulation. (p. 47)

reticular formation (reh-TICK-you-ler) A network of nerve fibers located in the center of the medulla that helps regulate attention, arousal, and sleep; also called the *reticular activating system.* (p. 68)

retina (RET-in-uh) A thin, light-sensitive membrane, located at the back of the eye, that contains the sensory receptors for vision. (p. 94)

retrieval The process of recovering information stored in memory so that we are consciously aware of it. (pp. 232, 243)

retrieval cue A clue, prompt, or hint that helps trigger recall of a given piece of information stored in long-term memory. (p. 243)

retrieval cue failure The inability to recall long-term memories because of inadequate or missing retrieval cues. (p. 243)

retroactive interference Forgetting in which a new memory interferes with remembering an old memory; backward-acting memory interference. (p. 251)

retrograde amnesia Loss of memory, especially for episodic information; backward-acting amnesia. (p. 265)

reuptake The process by which neurotransmitter molecules detach from a postsynaptic neuron and are reabsorbed by a presynaptic neuron so they can be recycled and used again. (p. 50)

rods The long, thin, blunt sensory receptors of the eye that are highly sensitive to light, but not to color, and that are primarily responsible for peripheral vision and night vision. (p. 94)

Rorschach Inkblot Test A projective test using inkblots, developed by Swiss psychiatrist Hermann Rorschach in 1921. (p. 474)

S

sample A selected segment of the population used to represent the group that is being studied (p. 24); a subset of a population. (p. A-13)

satiation (say-she-AY-shun) In eating behavior, the feeling of fullness and diminished desire to eat that accompanies eating a meal; in general, the sensation of having an appetite or desire fully or excessively satisfied. (p. 325)

saturation The property of color that corresponds to the purity of the light wave. (p. 98)

scatter diagram or scatter plot A graph that represents the relationship between two variables. (p. A-9)

schedule of reinforcement The delivery of a reinforcer according to a preset pattern based on the number of responses or the time interval between responses. (p. 211)

schema (SKEE-muh) An organized cluster of information about a particular topic. (p. 255)

schizophrenia A psychological disorder in which the ability to function is impaired by severely distorted beliefs, perceptions, and thought processes. (p. 592)

scientific method A set of assumptions, attitudes, and procedures that guide researchers in creating questions to investigate, in generating evidence, and in drawing conclusions. (p. 17)

script A schema for the typical sequence of an everyday event. (p. 255)

seasonal affective disorder (SAD) A mood disorder in which episodes of depression typically occur during the fall and winter and subside during the spring and summer. (p. 577)

secondary sex characteristics Sexual characteristics that develop during puberty and are not directly involved in reproduction but differentiate between the sexes, such as male facial hair and female breast development. (p. 383)

selection device validity The extent to which a personnel selection device is successful in distinguishing between those who will become high performers at a certain job and those who will not. (p. B-4)

selective serotonin reuptake inhibitors (SSRIs) Class of antidepressant medications that increase the availability of serotonin in the brain and cause fewer side effects than earlier antidepressants; they include Prozac, Paxil, and Zoloft. (p. 640)

self-actualization Defined by Maslow as a person's "full use and exploitation of talents, capacities, and potentialities." (p. 334)

self-concept The set of perceptions and beliefs that you hold about yourself. (p. 460)

self-determination theory (SDT) Edward Deci and Richard Ryan's theory that optimal human functioning can occur only if the psychological needs for autonomy, competence, and relatedness are satisfied. (p. 335)

self-efficacy The beliefs that people have about their ability to meet the demands of a specific situation; feelings of self-confidence or self-doubt. (pp. 354, 464)

self-report inventory A type of psychological test in which a person's responses to standardized questions are compared to established norms. (p. 476)

self-serving bias The tendency to attribute successful outcomes of one's own behavior to internal causes and unsuccessful outcomes to external, situational causes. (p. 492)

semantic memory Category of long-term memory that includes memories of general knowledge, concepts, facts, and names. (p. 240)

semantic network model A model that describes units of information in long-term memory as being organized in a complex network of associations. (p. 242)

sensation The process of detecting a physical stimulus, such as light, sound, heat, or pressure. (p. 88)

sensation seeking The degree to which an individual is motivated to experience high levels of sensory and physical arousal associated with varied and novel activities. (p. 321)

sense of self An individual's unique sense of identity that has been influenced by social, cultural, and psychological experiences; your sense of who you are in relation to other people. (p. 486)

sensorimotor stage In Piaget's theory, the first stage of cognitive development, from birth to about age 2; the period during which the infant explores the environment and acquires knowledge through sensing and manipulating objects. (p. 377)

sensory adaptation The decline in sensitivity to a constant stimulus. (p. 92)

sensory memory The stage of memory that registers information from the environment and holds it for a very brief period of time. (p. 232)

sensory neuron Type of neuron that conveys information to the brain from specialized receptor cells in sense organs and internal organs. (p. 45)

sensory receptors Specialized cells unique to each sense organ that respond to a particular form of sensory stimulation. (p. 89)

sensory-specific satiety (sah-TIE-it-tee) The reduced desire to continue consuming a particular food. (p. 326)

serial position effect The tendency to remember items at the beginning and end of a list better than items in the middle. (p. 245)

serotonin (ser-ah-TONE-in) Neurotransmitter involved in sensory perceptions, sleep, and emotions. (p. 52)

set-point theory Theory that proposes that humans and other animals have a natural or optimal body weight, called the *set-point weight,* that the body defends from becoming higher or lower by regulating feelings of hunger and body metabolism. (p. 327)

settling-point models of weight regulation General model of weight regulation suggesting that body weight settles, or stabilizes, around the point at which there is balance between the factors influencing energy intake and energy expenditure. (p. 327)

sex The biological category of male or female as defined by physical differences in genetic composition and in reproductive anatomy and function. (2) The behavioral manifestation of the sexual urge; sexual intercourse. (p. 408)

sex chromosomes Chromosomes, designated as X or Y, that determine biological sex; the 23rd pair of chromosomes in humans. (p. 363)

sexual aversion disorder A sexual dysfunction characterized by active avoidance of genital sexual contact because of extreme anxiety, fear, or disgust. (p. 432)

sexual dysfunction A consistent disturbance in sexual desire, arousal, or orgasm that causes psychological distress and interpersonal difficulties. (p. 431)

sexual orientation The direction of a person's emotional and erotic attraction toward members of the opposite sex, the same sex, or both sexes. (p. 409)

sexually transmitted diseases (STDs) Any of several infectious diseases that are transmitted primarily through sexual intercourse or other intimate sexual contact. (p. 433)

shape constancy The perception of a familiar object as maintaining the same shape regardless of the image produced on the retina. (p. 122)

shaping The operant conditioning procedure of selectively reinforcing successively closer approximations of a goal behavior until the goal behavior is displayed. (p. 209)

short-term dynamic therapies Type of psychotherapy that is based on psychoanalytic theory but differs in that it is typically time-limited, has specific goals, and involves an active, rather than neutral, role for the therapist. (p. 612)

short-term memory The active stage of memory in which information is stored for up to about 20 seconds. (p. 233)

situational (contingency) theories of leadership Leadership theories claiming that various situational factors influence a leader's effectiveness. (p. B-8)

Sixteen Personality Factor Questionnaire (16PF) A self-report inventory developed by Raymond Cattell that generates a personality profile with ratings on 16 trait dimensions. (p. 477)

size constancy The perception of an object as maintaining the same size despite changing images on the retina. (p. 122)

skewed distribution An asymmetrical distribution; more scores occur on one side of the distribution than on the other. In a *positively* skewed distribution, most of the scores are low scores; in a *negatively* skewed distribution, most of the scores are high scores. (p. A-4)

sleep disorders Serious and consistent sleep disturbances that interfere with daytime functioning and cause subjective distress. (p. 154)

sleep paralysis A temporary condition in which a person is unable to move upon awakening in the morning or during the night. (p. 141)

sleep spindles Short bursts of brain activity that characterize stage 2 NREM sleep. (p. 143)

sleep terrors A sleep disturbance characterized by an episode of increased physiological arousal, intense fear and panic, frightening hallucinations, and no recall of the episode the next morning; typically occurs during stage 3 or stage 4 NREM sleep; also called *night terrors*. (p. 157)

sleep thinking Vague, bland, thoughtlike ruminations about real-life events that typically occur during NREM sleep; also called *sleep mentation*. (p. 148)

sleep-related eating disorder (SRED) A sleep disorder in which the sleeper will sleepwalk and eat compulsively. (p. 157)

sleepsex A sleep disorder involving abnormal sexual behaviors and experiences during sleep; also called *sexsomnia*. (p. 157)

sleepwalking A sleep disturbance characterized by an episode of walking or performing other actions during stage 3 or stage 4 NREM sleep; also called *somnambulism*. (p. 157)

social categorization The mental process of categorizing people into groups (or *social categories*) on the basis of their shared characteristics. (p. 488)

social cognition The mental processes people use to make sense of their social environments. (p. 486)

social cognitive theory Albert Bandura's theory of personality, which emphasizes the importance of observational learning, conscious cognitive processes, social experiences, self-efficacy beliefs, and reciprocal determinism. (p. 464)

social facilitation The tendency for the presence of other people to enhance individual performance. (p. 519)

social influence The effects of situational factors and other people on an individual's behavior. (p. 486)

social learning theory of gender-role development The theory that gender roles are acquired through the basic processes of learning, including reinforcement, punishment, and modeling. (p. 416)

social loafing The tendency to expend less effort on a task when it is a group effort. (p. 518)

social norms The "rules," or expectations, for appropriate behavior in a particular social situation. (p. 487)

social phobia or social anxiety disorder An anxiety disorder involving the extreme and irrational fear of being embarrassed, judged, or scrutinized by others in social situations. (p. 570)

social psychology Branch of psychology that studies how a person's thoughts, feelings, and behavior are influenced by the presence of other people and by the social and physical environment. (p. 486)

social support The resources provided by other people in times of need. (p. 547)

somatic nervous system Subdivision of the peripheral nervous system that communicates sensory information to the central nervous system and carries motor messages from the central nervous system to the muscles. (p. 58)

source confusion A memory distortion that occurs when the true source of the memory is forgotten. (p. 254)

source memory or source monitoring Memory for when, where, and how a particular experience or piece of information was acquired. (p. 250)

source traits The most fundamental dimensions of personality; the broad, basic traits that are hypothesized to be universal and relatively few in number. (p. 467)

specific phobia An excessive, intense, and irrational fear of a specific object, situation, or activity that is actively avoided or endured with marked anxiety. (p. 569)

spinal reflexes Simple, automatic behaviors that are processed in the spinal cord. (p. 57)

split-brain operation A surgical procedure that involves cutting the corpus callosum. (p. 76)

spontaneous recovery The reappearance of a previously extinguished conditioned response after a period of time without exposure to the conditioned stimulus. (p. 189)

stage model of memory A model describing memory as consisting of three distinct stages: sensory memory, short-term memory, and long-term memory. (p. 232)

standard deviation A measure of variability; expressed as the square root of the sum of the squared deviations around the mean divided by the number of scores in the distribution. (p. A-6)

standard normal curve or standard normal distribution A symmetrical distribution forming a bell-shaped curve in which the mean, median, and mode are all equal and fall in the exact middle. (p. A-8)

standardization The administration of a test to a large, representative sample of people under uniform conditions for the purpose of establishing norms. (p. 297)

statistically significant A mathematical indication that research results are not very likely to have occurred by chance. (p. 19)

statistics A branch of mathematics used by researchers to organize, summarize, and interpret data. (pp. 19, A-2)

stem cells Undifferentiated cells that can divide and give rise to cells that can develop into any one of the body's different cell types. (p. 366)

stereotype A cluster of characteristics that are associated with all members of a specific social group, often including qualities that are unrelated to the objective criteria that define the group. (p. 498)

stereotype threat A psychological predicament in which fear that you will be evaluated in terms of a negative stereotype about a group to which you belong creates anxiety and self-doubt, lowering performance in a particular domain that is important to you. (p. 308)

stimulant-induced psychosis Schizophrenia-like symptoms that can occur as the result of prolonged amphetamine or cocaine use; also called *amphetamine-induced psychosis* or *cocaine-induced psychosis*. (p. 174)

stimulants A category of psychoactive drugs that increase brain activity, arouse behavior, and increase mental alertness. (p. 172)

stimulus control therapy Insomnia treatment involving specific guidelines to create a strict association between the bedroom and rapid sleep onset. (p. 178)

stimulus discrimination The occurrence of a learned response to a specific stimulus but not to other, similar stimuli. (p. 188)

stimulus generalization The occurrence of a learned response not only to the original stimulus but to other, similar stimuli as well. (p. 188)

stimulus threshold The minimum level of stimulation required to activate a particular neuron. (p. 47)

storage The process of retaining information in memory so that it can be used at a later time. (p. 232)

stress A negative emotional state occurring in response to events that are perceived as taxing or exceeding a person's resources or ability to cope. (p. 527)

stressors Events or situations that are perceived as harmful, threatening, or challenging. (p. 529)

structural plasticity The brain's ability to change its physical structure in response to learning, active practice, or environmental influences. (p. 64)

structuralism Early school of psychology that emphasized studying the most basic components, or structures, of conscious experiences. (p. 4)

sublimation An ego defense mechanism that involves redirecting sexual urges toward productive, socially acceptable, nonsexual activities; a form of displacement. (p. 450)

subliminal perception The detection of stimuli that are below the threshold of conscious awareness; nonconscious perception. (p. 90)

substance P A neurotransmitter that is involved in the transmission of pain messages to the brain. (p. 109)

substantia nigra (sub-STAN-she-uh NYE-gruh) An area of the midbrain that is involved in motor control and contains a large concentration of dopamine-producing neurons. (p. 68)

superego In Freud's theory, the partly conscious, self-evaluative, moralistic component of personality that is formed through the internalization of parental and societal rules. (p. 449)

suppression Motivated forgetting that occurs consciously; a deliberate attempt to not think about and remember specific information. (p. 252)

suprachiasmatic nucleus (SCN) (soup-rah-*kye*-az-MAT-ick) A cluster of neurons in the hypothalamus in the brain that governs the timing of circadian rhythms. (p. 138)

surface traits Personality characteristics or attributes that can easily be inferred from observable behavior. (p. 467)

survey A questionnaire or interview designed to investigate the opinions, behaviors, or characteristics of a particular group. (p. 24)

symbolic thought The ability to use words, images, and symbols to represent the world. (p. 377)

symmetrical distribution A distribution in which scores fall equally on both sides of the graph. The normal curve is an example of a symmetrical distribution. (p. A-4)

sympathetic nervous system Branch of the autonomic nervous system that produces rapid physical arousal in response to perceived emergencies or threats. (p. 58)

synapse (SIN-aps) The point of communication between two neurons. (p. 49)

synaptic gap (sin-AP-tick) The tiny space between the axon terminal of one neuron and the dendrite of an adjoining neuron. (p. 49)

synaptic transmission (sin-AP-tick) The process through which neurotransmitters are released by one neuron, cross the synaptic gap, and affect adjoining neurons. (p. 50)

synaptic vesicles (sin-AP-tick VESS-ick-ulls) Tiny pouches or sacs in the axon terminals that contain chemicals called neurotransmitters. (p. 50)

systematic desensitization A type of behavior therapy in which phobic responses are reduced by pairing relaxation with a series of mental images or real-life situations that the person finds progressively more fear-provoking; based on the principle of counterconditioning. (p. 617)

T

taste aversion A classically conditioned dislike for and avoidance of a particular food that develops when an organism becomes ill after eating the food. (p. 197)

taste buds The specialized sensory receptors for taste that are located on the tongue and inside the mouth and throat. (p. 107)

telomeres Repeated, duplicate DNA sequences that are found at the very tips of chromosomes and that protect the chromosomes' genetic data during cell division. (p. 537)

temperament Inborn predispositions to consistently behave and react in a certain way. (p. 369)

temporal lobe An area on each hemisphere of the cerebral cortex near the temples that is the primary receiving area for auditory information. (p. 69)

teratogens Harmful agents or substances that can cause malformations or defects in an embryo or fetus. (p. 365)

thalamus (THAL-uh-muss) A forebrain structure that processes sensory information for all senses, except smell, and relays it to the cerebral cortex. (p. 72)

Thanatos The death instinct, reflected in aggressive, destructive, and self-destructive actions. (p. 448)

Thematic Apperception Test (TAT) A projective personality test that involves creating stories about each of a series of ambiguous scenes. (pp. 336, 476)

theory A tentative explanation that tries to integrate and account for the relationship of various findings and observations. (p. 21)

thinking The manipulation of mental representations of information in order to draw inferences and conclusions. (p. 277)

timbre (TAM-ber) The distinctive quality of a sound, determined by the complexity of the sound wave. (p. 101)

tip-of-the-tongue (TOT) experience A memory phenomenon that involves the sensation of knowing that specific information is stored in long-term memory, but being temporarily unable to retrieve it. (p. 244)

token economy A form of behavior therapy in which the therapeutic environment is structured to reward desired behaviors with tokens or points that may eventually be exchanged for tangible rewards. (p. 620)

top-down processing Information processing that emphasizes the importance of the observer's knowledge, expectations, and other cognitive processes in arriving at meaningful perceptions; analysis that moves from the whole to the parts; also called *conceptually driven processing.* (p. 112)

trait A relatively stable, enduring predisposition to consistently behave in a certain way. (p. 467)

trait approach to leader effectiveness An approach to determining what makes an effective leader that focuses on the personal characteristics displayed by successful leaders. (p. B-8)

trait theory A theory of personality that focuses on identifying, describing, and measuring individual differences in behavioral predispositions. (p. 467)

tranquilizers Depressant drugs that relieve anxiety. (p. 171)

transduction The process by which a form of physical energy is converted into a coded neural signal that can be processed by the nervous system. (p. 89)

transference In psychoanalysis, the process by which emotions and desires originally associated with a significant person in the patient's life, such as a parent, are unconsciously transferred onto the psychoanalyst. (p. 611)

transgendered Condition in which a person's psychological gender identity conflicts with his or her biological sex. (p. 417)

transsexual A transgendered person who undergoes surgery and hormone treatments to physically transform his or her body into the opposite sex. (p. 417)

trial and error A problem-solving strategy that involves attempting different solutions and eliminating those that do not work. (p. 281)

triarchic theory of intelligence Robert Sternberg's theory that there are three distinct forms of intelligence: analytic, creative, and practical. (p. 301)

trichromatic theory of color vision The theory that the sensation of color results because cones in the retina are especially sensitive to red light (long wavelengths), green light (medium wavelengths), or blue light (short wavelengths). (p. 99)

***t*-test** Test used to establish whether the means of two groups are statistically different from each other. (p. A-11)

two-factor theory of emotion Schachter and Singer's theory that emotion is the interaction of physiological arousal and the cognitive label that we apply to explain the arousal. (p. 351)

Type A behavior pattern A behavioral and emotional style characterized by a sense of time urgency, hostility, and competitiveness. (p. 544)

Type I error Erroneously concluding that study results are significant. (p. A-12)

Type II error Failing to find a significant effect that does, in fact, exist. (p. A-12)

U

unconditional positive regard In Rogers's theory, the sense that you will be valued and loved even if you don't conform to the standards and expectations of others; unconditional love or acceptance. (p. 462)

unconditioned response (UCR) The unlearned, reflexive response that is elicited by an unconditioned stimulus. (p. 186)

unconditioned stimulus (UCS) The natural stimulus that reflexively elicits a response without the need for prior learning. (p. 186)

unconscious In Freud's theory, a term used to describe thoughts, feelings, wishes, and drives that are operating below the level of conscious awareness. (p. 447)

V

vaginismus Sexual dysfunction characterized by persistent, involuntary contractions or spasms of the vaginal muscles, which result in uncomfortable or painful intercourse. (p. 432)

validity The ability of a test to measure what it is intended to measure. (p. 298)

variable A factor that can vary, or change, in ways that can be observed, measured, and verified. (p. 18)

variable-interval (VI) schedule A reinforcement schedule in which a reinforcer is delivered for the first response that occurs after an average time interval, which varies unpredictably from trial to trial. (p. 211)

variable-ratio (VR) schedule A reinforcement schedule in which a reinforcer is delivered after an average number of responses, which varies unpredictably from trial to trial. (p. 211)

vestibular sense (vess-TIB-you-ler) The technical name for the sense of balance, or equilibrium. (p. 111)

W

wavelength The distance from one wave peak to another. (p. 92)

Weber's law (VAY-berz) A principle of sensation that holds that the size of the just noticeable difference will vary depending on its relation to the strength of the original stimulus. (p. 90)

weight cycling Repeated cycles of dieting, weight loss, and weight regain; also called *yo-yo dieting*. (p. 332)

withdrawal symptoms Unpleasant physical reactions, combined with intense drug cravings, that occur when a person abstains from a drug on which he or she is physically dependent. (p. 166)

working memory The temporary storage and active, conscious manipulation of information needed for complex cognitive tasks, such as reasoning, learning, and problem solving. (p. 237)

Z

***z* score** A number, expressed in standard deviation units, that shows a score's deviation from the mean. (p. A-8)

zone of proximal development In Vygotsky's theory of cognitive development, the difference between what children can accomplish on their own and what they can accomplish with the help of others who are more competent. (p. 381)

zygote The single cell formed at conception from the union of the egg cell and sperm cell. (p. 362)

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